May 20, 1988

PART 2
REMEDIAL INVESTIGATIVE WORK
PHASE 2A GROUNDWATER, SOIL, AND SEDIMENT SAMPLING PLAN
MONTROSE SITE
TORRANCE, CALIFORNIA

HARGIS+ASSOCIATES, INC.

Consultants in Hydrogeology

Tucson/Phoenix/San Diego

GEOPHYSICAL LOG OF
MONITOR WELL LG-1

GEO-HYDRO-DATA

INCORPORATED

ELECTRIC WELL LOG

COMPANY MONTROSE CHEMICAL
WELL G-1
FIELD TORRANCE
COUNTY LA STATE CALIF

COMPANY	MONTROSE CHEMOCAL
WELL	G-1
FIELD	TORRANCE
COUNTY	LA
STATE	CALIF
LOCATION	
Sec.	
Twp.	
Rge.	
TYPE LOG	SP,PR,6' LAT
Permanent Datum	GROUND LEVEL
Elev.	
Elev.: K. B.	
Log Measured From	G.L. 0 Ft. Above Perm. Datum
D. F.	
Drilling Measured From	G.L.
G. L.	

Date	Nov. 17, 1986		
Run No.	1		
Depth — Driller	136 ft.	ft.	ft.
Depth — GHD	136 ft.	ft.	ft.
Btm. Log Inter.	136 ft.	ft.	ft.
Top Log Inter.	6/7 ft.	ft.	ft.
Casing — Driller	in. @ ft.	in. @ ft.	in. @ ft.
Casing — GHD	ft.	ft.	ft.
Bit Size	18 in. to 136 ft.	in. to ft.	in. to ft.
Bit Size	in. to ft.	in. to ft.	in. to ft.
Bit Size	in. to ft.	in. to ft.	in. to ft.
Type Fluid in Hole	clay gel		
Source of Sample	ditch		
PPM TDS	600		
Fluid Level	full ft.	ft.	ft.
Dens. / Visc.			
pH / Fluid Loss	ml	ml	ml
Rm @ Meas. Temp.	@ °F	@ °F	@ °F
Rmf @ Meas. Temp.	@ °F	@ °F	@ °F
Rmc @ Meas. Temp.	@ °F	@ °F	@ °F
Time Since Circ.	1 hr.	hr.	hr.
Logging Speed	45 ft./min.	ft./min.	ft./min.
Tool Type and No.	combo 2		
Unit No.	3		
Location	Cambria		
Invoice No.	4654		
Recorded By	Kenny Renz Associate Geologist		
Witnessed By	~~Roger~~		
other			

P. O. Box 418 Tehachapi, California 93561 (805) 832-4101

Field Here

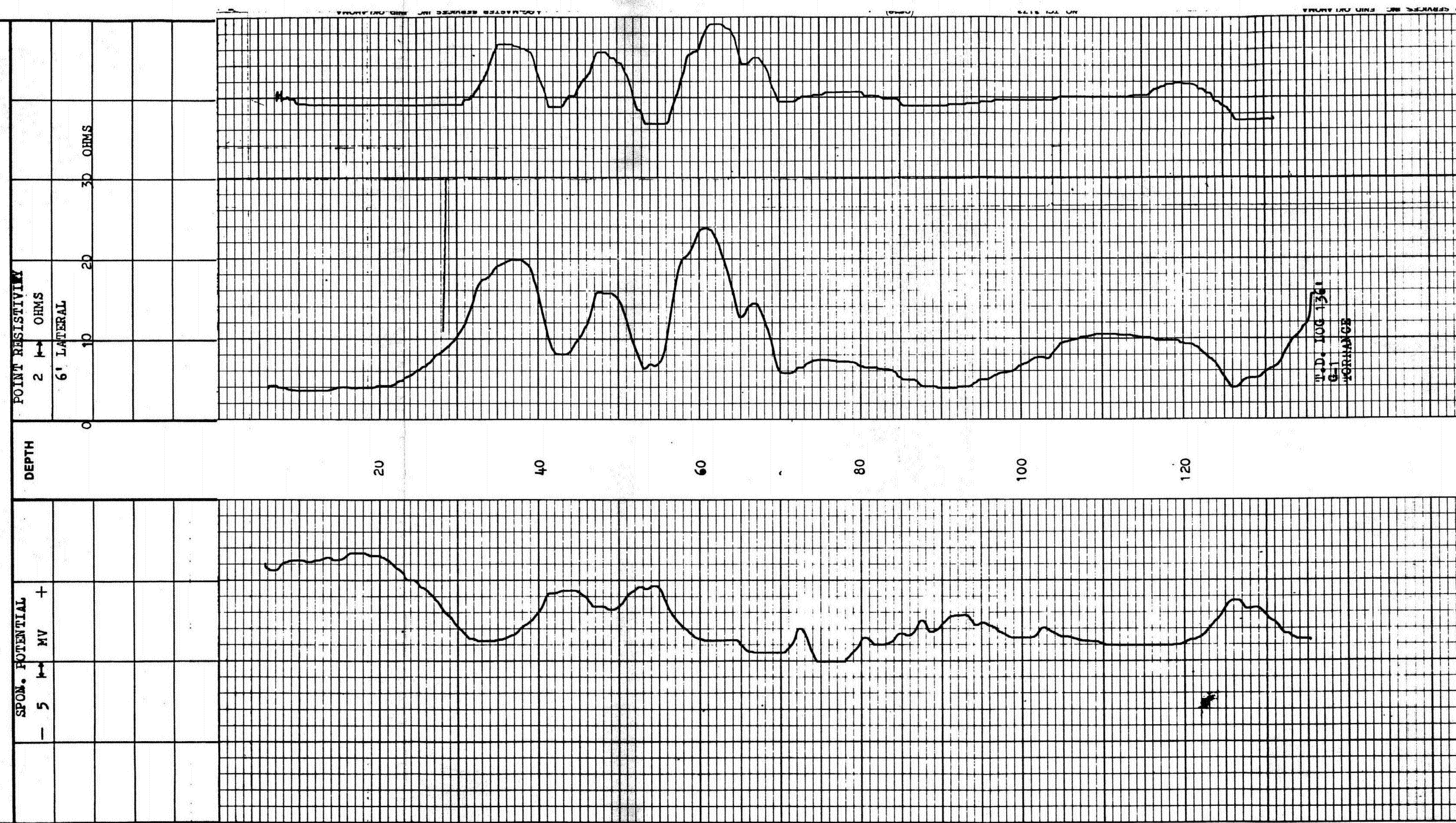
REMARKS:

DRILL METHOD: STANDARD ROTARY

DRILLED BY: BEYLIK DRILLING LA HABRA, CALIF

SCALE CHANGES			
Type Log	Depth	Scale Up Hole	Scale Down Hole

All interpretations are opinions based on inferences from electrical or other measurements and we cannot, and do not guarantee the accuracy or correctness of any interpretations, and we shall not be liable or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. These interpretations are also subject to Clause 6 of our General Terms and Conditions as set out in our current Price Schedule.



BOE-C6-0185424

GEO-HYDRO-DATA
INCORPORATED
ELECTRIC WELL LOG

KBF—0549

COMPANY MONTROSE CHEMICAL
WELL G-3
FIELD NEAR TORRANCE
COUNTY LA
STATE CA

COMPANY MONTROSE CHEMICAL

WELL G-3

FIELD NEAR TORRANCE

COUNTY LOS ANGELES STATE CALIFORNIA

LOCATION

Sec. Twp. Rge.

TYPE LOG
SP, PR,
6' LATERAL

Permanent Datum GROUND LEVEL Elev.

Log Measured From G.L. 0 Ft. Above Perm. Datum

Drilling Measured From GROUND LEVEL

Elev.: K. B.

D. F.

G. L.

Date	20 Nov 85		
Run No.	one		
Depth — Driller	135 ft.	ft.	ft.
Depth — GHD	135 ft.	ft.	ft.
Btm. Log Inter.	135 ft.	ft.	ft.
Top Log Inter.	10 ft.	ft.	ft.
Casing — Driller	in. @ ft.	in. @ ft.	in. @ ft.
Casing — GHD	ft.	ft.	ft.
Bit Size	18 in. to TD ft.	in. to ft.	in. to ft.
Bit Size	in. to ft.	in. to ft.	in. to ft.
Bit Size	in. to ft.	in. to ft.	in. to ft.
Type Fluid in Hole	gel		
Source of Sample	ditch		
PPM TDS	600		
Fluid Level	8 ft.	ft.	ft.
Dens. / Visc.			
pH / Fluid Loss	ml	ml	ml
Rm @ Meas. Temp.	@ °F	@ °F	@ °F
Rmf @ Meas. Temp.	@ °F	@ °F	@ °F
Rmc @ Meas. Temp.	@ °F	@ °F	@ °F
Time Since Circ.	½ hr.	hr.	hr.
Logging Speed	30 ft./min.	ft./min.	ft./min.
Tool Type and No.	combo 15		
Unit No.	4		
Location	Shafter		
Invoice No.	4728		
Recorded By	Mike Alexander	Assoc. Geologist	
Witnessed By	Roger Niemeyer		
other			

P. O. Box 418 Tehachapi, California 93561 (805) 832-4101

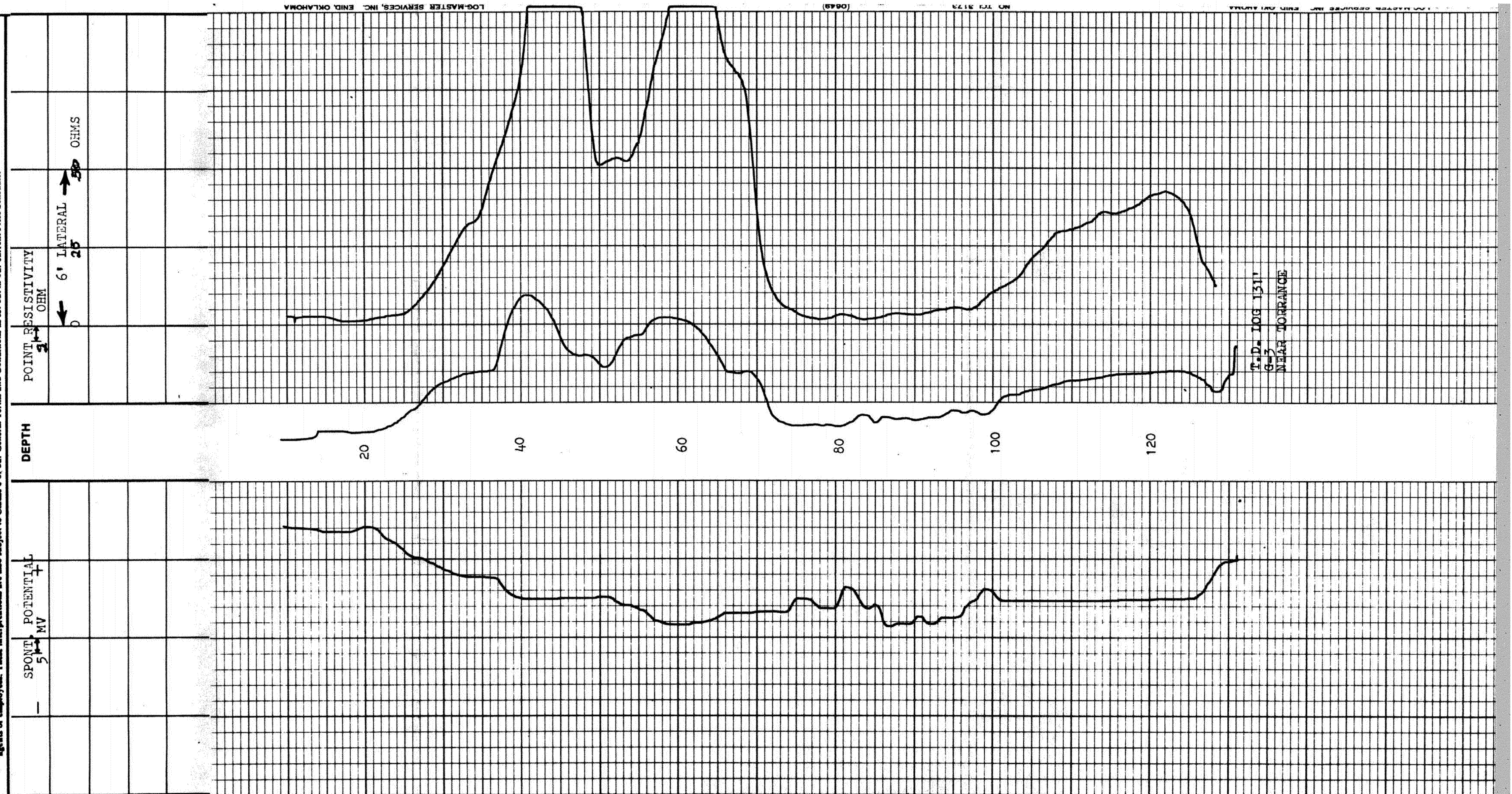
Fold Here

SCALE CHANGES			
Type Log	Depth	Scale Up Hole	Scale Down Hole

REMARKS:

DRILL METHOD: STANDARD ROTARY
CONSULTANT: HARGIS & ASSOC. LA JOLLA, CA

DRILLED BY: BEYLIK DRILLING
LA HABRA, CA.



GEO-HYDRO-DATA
INCORPORATED
ELECTRIC WELL LOG

KSP—8548

COMPANY MONTROSE CHEMICAL
WELL G-1
FIELD TORRANCE
COUNTY LA STATE CALIF

COMPANY MONTROSE CHEMOCAL
WELL G-1
FIELD TORRANCE
COUNTY LA STATE CALIF

LOCATION
Sec.___ Twp.___ Rge.___

TYPE LOG
SP,PR,6' LAT

Permanent Datum GROUND LEVEL Elev.___ Elev.: K.B.___
Log Measured From G.L. 0 Ft. Above Perm. Datum D.F.___
Drilling Measured From G.L. G.L.___

Date	Nov. 17, 1986		
Run No.	1		
Depth — Driller	136 ft.	ft.	ft.
Depth — GHD	136 ft.	ft.	ft.
Btm. Log Inter.	136 ft.	ft.	ft.
Top Log Inter.	6/7 ft.	ft.	ft.
Casing — Driller	in. @ ft.	in. @ ft.	in. @ ft.
Casing — GHD	ft.	ft.	ft.
Bit Size	18 in. to 136 ft.	in. to ft.	in. to ft.
Bit Size	in. to ft.	in. to ft.	in. to ft.
Bit Size	in. to ft.	in. to ft.	in. to ft.
Type Fluid in Hole	clay gel		
Source of Sample	ditch		
PPM TDS	600		
Fluid Level	full ft.	ft.	ft.
Dens. / Visc.			
pH / Fluid Loss	ml	ml	ml
Rm @ Meas. Temp.	@ °F	@ °F	@ °F
Rmf @ Meas. Temp.	@ °F	@ °F	@ °F
Rmc @ Meas. Temp.	@ °F	@ °F	@ °F
Time Since Circ.	1 hr.	hr.	hr.
Logging Speed	45 ft./min.	ft./min.	ft./min.
Tool Type and No.	combo 2		
Unit No.	3		
Location	Cambria		
Invoice No.	4654		
Recorded By	Kenny Renz Associate Geologist		
Witnessed By	~~Roger~~		
other			

P. O. Box 418 Tehachapi, California 93561 (805) 832-4101

Fold Here

SCALE CHANGES			
Type Log	Depth	Scale Up Hole	Scale Down Hole

REMARKS:
DRILL METHOD: STANDARD ROTARY
DRILLED BY: BEYLIK DRILLING
LA HABRA, CALIF

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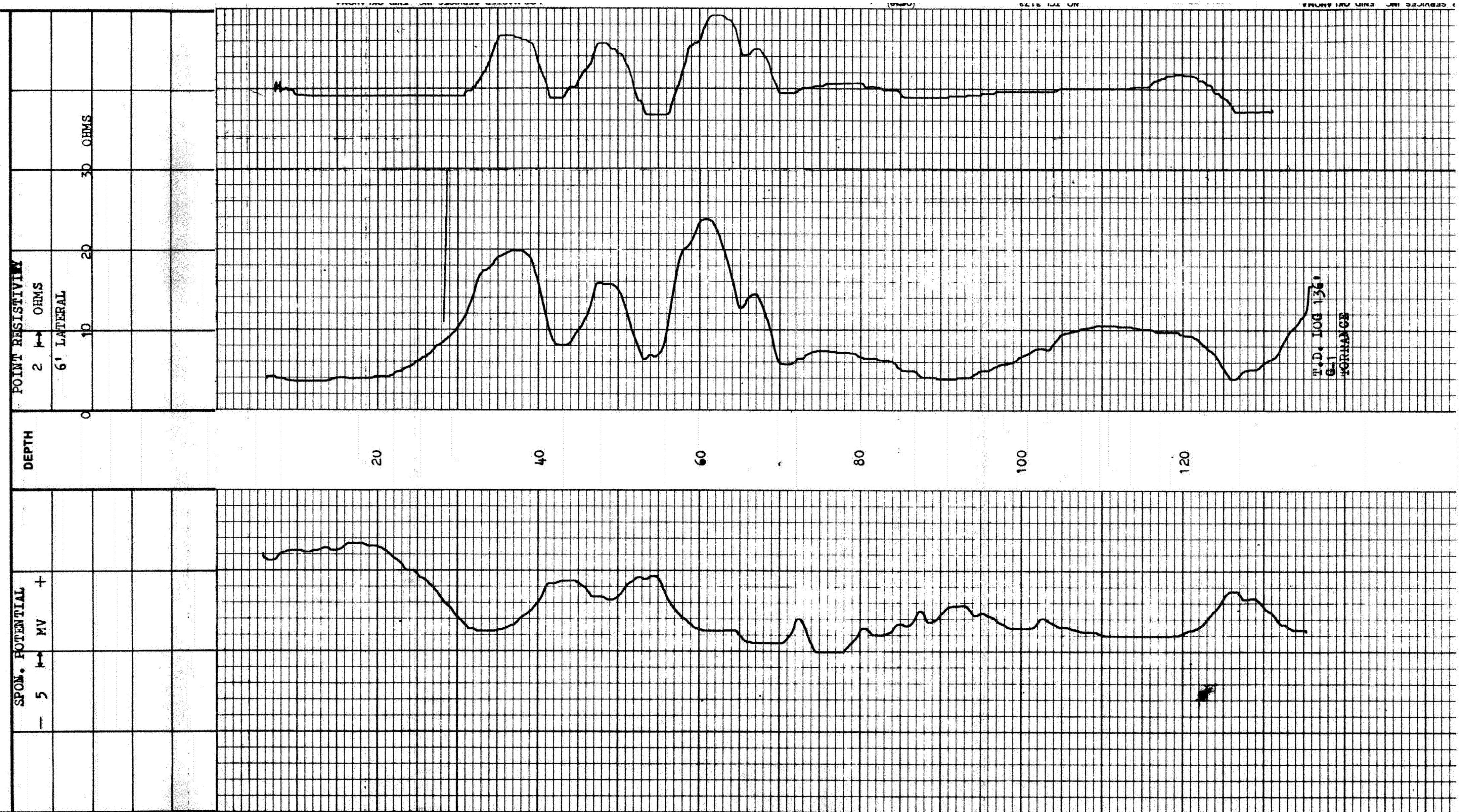


BOE-C6-0185426

GEO-HYDRO-DATA
INCORPORATED
ELECTRIC WELL LOG

COMPANY	MONTROSE CHEMICAL
WELL	EB-2
FIELD	NEAR TORRANCE
COUNTY	LOS ANGELES
STATE	CALIFORNIA
LOCATION	Sec. ___ Twp. ___ Rge. ___
TYPE LOG	SP, PR, 6' LATERAL, NAT. GAMMA

COMPANY MONTROSE CHEMICAL — WELL EB-2 — FIELD NEAR TORRANCE — COUNTY LA — STATE CA

Permanent Datum GROUND LEVEL Elev. ___ Elev.: K.B. ___
Log Measured From G.L. 0 Ft. Above Perm. Datum D.F. ___
Drilling Measured From GROUND LEVEL G.L. ___

Date	23 Oct 86		
Run No.	one	two	
Depth — Driller	242.5 ft.	ft.	ft.
Depth — GHD	242.5 ft.	ft.	ft.
Btm. Log Inter.	242.5 ft.	ft.	ft.
Top Log Inter.	10 ft.	10 ft.	ft.
Casing — Driller	in. @ ft.	in. @ ft.	in. @ ft.
Casing — GHD	ft.	ft.	ft.
Bit Size	6¼ in. toTD ft.	in. to ft.	in. to ft.
Bit Size	in. to ft.	in. to ft.	in. to ft.
Bit Size	in. to ft.	in. to ft.	in. to ft.
Type Fluid in Hole	gel		
Source of Sample	ditch		
PPM TDS	700		
Fluid Level	full ft.	ft.	ft.
Dens. / Visc.			
pH / Fluid Loss	ml	ml	ml
Rm @ Meas. Temp.	@ °F	@ °F	@ °F
Rmf @ Meas. Temp.	@ °F	@ °F	@ °F
Rmc @ Meas. Temp.	@ °F	@ °F	@ °F
Time Since Circ.	½ hr.	hr.	hr.
Logging Speed	10 ft./min.	30 ft./min.	ft./min.
Tool Type and No.	gamma 3	combo 15	
Unit No.	4		
Location	Shafter		
Invoice No.	4594		
Recorded By	Mike Alexander	Assoc. geologist	
Witnessed By	Roger Niemeyer		
other			

P. O. Box 418 Tehachapi, California 93561 (805) 822-4101

SCALE CHANGES			
Type Log	Depth	Scale Up Hole	Scale Down Hole

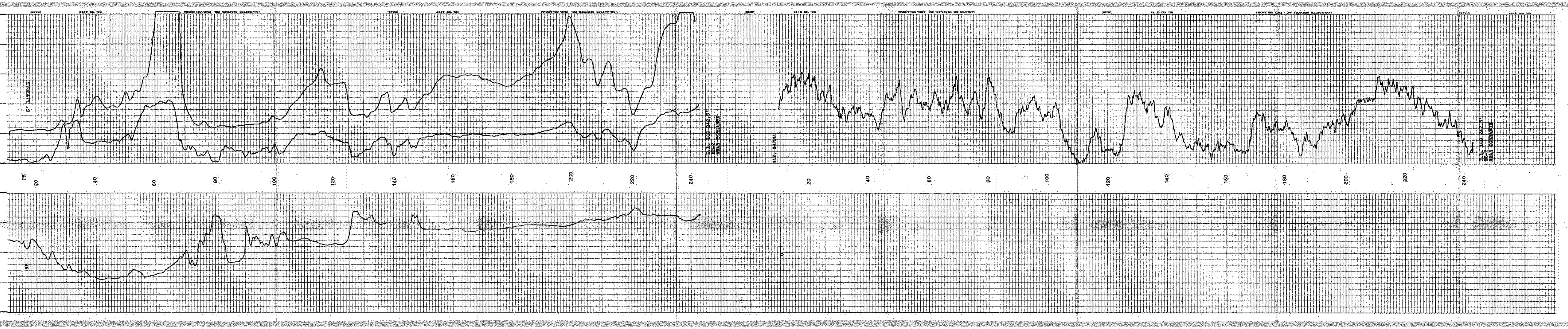
REMARKS:
DRILL METHOD: STANDARD ROTARY/ CORE
CONSULTANT: HARGIS & ASSOC. LA JOLLA, CA.
DRILLED BY: BEYLIK DRILLING LA HABRA, CA.

All interpretations are opinions based on inferences from electrical or other measurements and we cannot, and do not guarantee the accuracy or correctness of any interpretations, and we shall not be liable or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. These interpretations are also subject to Clause 6 of our General Terms and Conditions as set out in our current Price Schedule.

POINT RESISTIVITY 5 ← OHM ← 0 6' LATERAL → 25 50 OHMS

DEPTH

SPONT. POTENTIAL − 5 ← MV +
NAT. GAMMA SENS. 25 T/C 2Sec. L/S 10 0 → INCREASE



BOE-C6-0185427

GEO-HYDRO-DATA
INCORPORATED
ELECTRIC WELL LOG

COMPANY MONTROSE CHEMICAL
WELL EB-1
FIELD NEAR TORRANCE
COUNTY LA STATE CA

COMPANY MONTROSE CHEMICAL

WELL EB-1
FIELD NEAR TORRANCE
COUNTY LOS ANGELES STATE CALIFORNIA

LOCATION
Sec. ____ Twp. ____ Rge. ____

TYPE LOG SP, PR, 6' LATERAL NAT GAMMA

Permanent Datum GROUND LEVEL Elev. ____
Log Measured From G.L. 0 Ft. Above Perm. Datum
Drilling Measured From GROUND LEVEL
Elev.: K.B. ____ D.F. ____ G.L. ____

Date	13 Oct 86		
Run No.	one	two	
Depth — Driller	238 ft.	238 ft.	ft.
Depth — GHD	237 ft.	238 ft.	ft.
Btm. Log Inter.	237 ft.	238 ft.	ft.
Top Log Inter.	35 ft.	8 ft.	ft.
Casing — Driller	in. @ ft.	in. @ ft.	in. @ ft.
Casing — GHD	ft.	ft.	ft.
Bit Size	4 5/8 in. to 238 ft.	in. to ft.	in. to ft.
Bit Size	in. to ft.	in. to ft.	in. to ft.
Bit Size	in. to ft.	in. to ft.	in. to ft.
Type Fluid in Hole	gel		
Source of Sample	ditch		
PPM TDS	700		
Fluid Level	35 ft.	ft.	ft.
Dens. / Visc.			
pH / Fluid Loss	ml	ml	ml
Rm @ Meas. Temp.	@ °F	@ °F	@ °F
Rmf @ Meas. Temp.	@ °F	@ °F	@ °F
Rmc @ Meas. Temp.	@ °F	@ °F	@ °F
Time Since Circ.	1 hr.	hr.	hr.
Logging Speed	30 ft./min.	10 ft./min.	ft./min.
Tool Type and No.	combo 15	gamma 3	
Unit No.	4		
Location	Shafter		
Invoice No.	4593		
Recorded By	Mike Alexander Assoc. Geologist		
Witnessed By	Roger Niemeyer		
other			

P. O. Box 418 Tehachapi, California 93561 (805) 832-4101

SCALE CHANGES

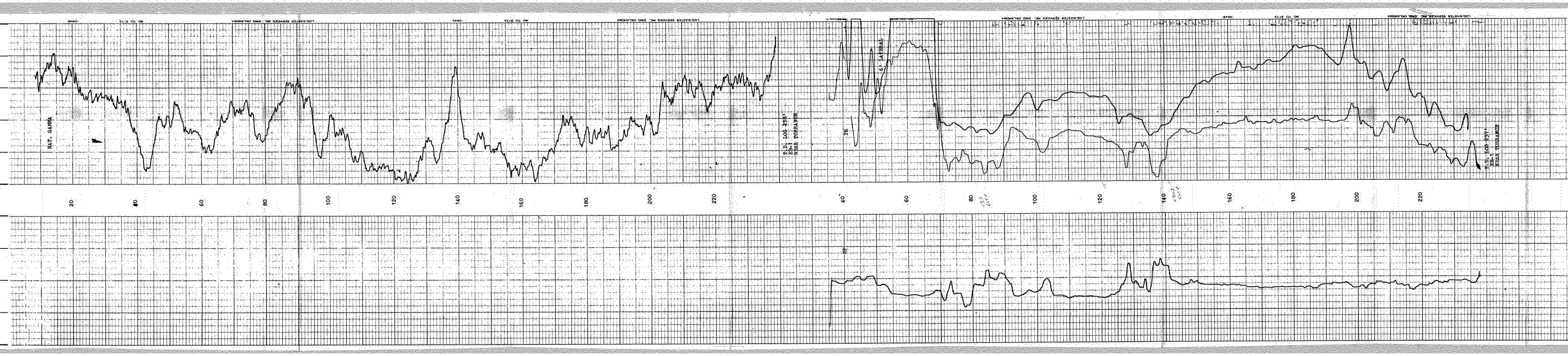
Type Log	Depth	Scale Up Hole	Scale Down Hole

REMARKS:
DRILL METHOD: STANDARD ROTARY/CORE
CONSULTANT: HARGIS & ASSOC. LA JOLLA, CA.
DRILLED BY: PIONEER DRILLING REDLANDS, CA.

POINT RESISTIVITY 5 OHM
0 ← 6' LATERAL 25 → 50 OHMS

DEPTH

SPONT POTENTIAL 5 MV − +
NAT. GAMMA
SENS. 25 T/C 2 sec. 1/5 to 0 → INCREASE



BOE-C6-0185428

APPENDIX B

GEOPHYSICAL LOGS

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APPENDIX B

GEOPHYSICAL LOGS

May 20, 1988

PART 2
REMEDIAL INVESTIGATIVE WORK
PHASE 2A GROUNDWATER, SOIL, AND SEDIMENT SAMPLING PLAN
MONTROSE SITE
TORRANCE, CALIFORNIA

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REMEDIAL INVESTIGATIVE WORK
PHASE 2A GROUNDWATER, SOIL, AND SEDIMENT SAMPLING PLAN
MONTROSE SITE
TORRANCE, CALIFORNIA

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ILLUSTRATIONS

* In pocket

PART 2
REMEDIAL INVESTIGATIVE WORK
PHASE 2A GROUNDWATER, SOIL, AND SEDIMENT SAMPLING PLAN
MONTROSE SITE
TORRANCE, CALIFORNIA

INTRODUCTION

This Sampling Plan has been prepared as part of the remedial investigation work being conducted at the Montrose Chemical Corporation site in Torrance, California (Montrose site) in compliance with a consent order (U.S. EPA Docket No. 85-04) entered into by the EPA and Montrose Chemical Corporation of California on October 28, 1985 and amended on October 28, 1987. Adherence to the plan will ensure that sufficient data of acceptable quality are collected to support the Feasibility Study. The plan describes methodologies which will provide records of traceability, ensure adherence to prescribed protocols, and ensure that the data provide a basis from which sound conclusions can be drawn. The sampling plan is to be implemented during the Phase 2A RIW field activities (Phase 2A), in the vicinity of the Montrose site and includes discussion of the following:

.. Historical background and history of response of the project.

.. Objectives of the Phase 2A soil, sediment, and groundwater assessment.

.. Target Chemicals and laboratory analyses required.

.. Hydrogeologic conditions.

.. Monitor well locations and construction.

.. Soil sampling locations.

.. Number and frequency of samples to be collected.

.. Sampling equipment and methods of sample collection, preservation, and handling.

.. Sample storage and shipping methods.

.. Chain-of-custody procedures.

.. Quality Assurance (QA) procedures.

Additional details on field procedures and methods are described in the accompanying Quality Assurance Project Plan (QAPP)(Hargis + Associates, Inc., 1988). The Health and Safety Plan (HSP) was prepared for Hargis + Associates, Inc. by Clayton Environmental Consultants and will be submitted as a separate document (Clayton Environmental Consultants, 1988).

HISTORICAL BACKGROUND

The Montrose site occupies about 13 acres in Torrance, California (Figure 1). The area is bounded by the Southern Pacific Railroad (SPRR) right-of-way and Normandie Avenue on the east, Jones Chemical Company and Los Angeles Department of Water and Power (LADWP) property on the south, a vacant lot on the west, and the McDonnell-Douglas facility on the north. The surrounding area consists of mixed residential, commercial, and industrial uses.

Between 1947 and 1982, the Montrose Chemical Company (Montrose) operated a dichloro-diphenyl-trichloroethane (DDT) manufacturing plant at the Montrose site. Although the use of DDT was banned in the United States in 1972, its use was not banned in other countries. Montrose continued to manufacture and export DDT until 1982, when the facility was closed and subsequently dismantled. The Montrose site is now capped with asphalt.

HISTORY OF RESPONSE

Previous investigations addressing the potential for migration of organic compounds from the Montrose site including off-site sampling of soil, sediment and surface runoff were conducted by the U.S. Environmental Protection Agency (EPA) and its contractors, the California Department of Health Services (DOHS), and the Los Angeles Regional Water Quality Control Board (RWQCB). An EPA investigation in November 1982 detected DDT in surface water runoff and sediment off-site. The majority of Montrose site data collected by public agencies have been summarized in Metcalf & Eddy, Inc. (1983).

In June 1983 Montrose submitted a proposal for remedial action at the Montrose site. During the same year Montrose constructed a temporary earthen berm to contain storm water, preventing drainage off-site. While the earthen berm was being constructed, consultants for Montrose drilled nine soil borings in the LADWP right-of-way and the area adjacent to the Farmer Brothers Coffee (Farmer Bros.) facility immediately south of the Montrose site to characterize off-site concentrations of chemical residues. The soils were sampled at varying depths up to 5.5 feet below land surface (bls) and analyzed for DDT and its isomers (Hargis & Montgomery, Inc., 1983). In early 1985, the entire on-site area was graded and capped with asphalt so that no portion of the soil remained exposed. The cap was constructed to prevent wind and water from transporting soil off-site and to minimize infiltration of surface water. A concrete curb was constructed around the perimeter to minimize the potential for upgradient drainage entering the site.

In April and May 1985, soil sampling, monitor well construction, and groundwater sampling activities were performed at the request of Montrose (Hargis + Associates, Inc., 1985). Soil from a 50-foot deep boring located in the center of a buried surface impoundment was sampled at 5-foot intervals beginning at approximately 23 feet bls. Soil samples were also collected from the monitor well borings at 5-foot intervals between approximately 5 and 75 feet bls. All soil samples were analyzed for volatile organic compounds

(VOC's), pesticides, base neutrals/acid organics, and chloral. Five monitor wells were constructed and screened between approximately 65 and 75 feet bls in the upper Bellflower aquitard. Groundwater samples were collected from each of the five monitor wells and analyzed for the same analytes as the soil samples, and common ions.

Remedial Investigation Part 1 Activity

In June 1985, EPA contractor Metcalf & Eddy, Inc. conducted a preliminary field investigation that included soil sample collection from 17 soil borings and groundwater sample collection from the five monitor wells constructed in April 1985 by Hargis + Associates, Inc. In March 1986, Metcalf & Eddy, Inc. released a Draft Preliminary Report summarizing their findings from the June 1985 study (Metcalf & Eddy, Inc., 1986). The report included recommendations on additional field data requirements and a list of Target Chemicals. Target Chemicals are defined on Page 8 of this report.

Remedial Investigation Part 2, Phase 1 Activity

In October 1985, a Consent Order between the EPA and Montrose concerning the performance of additional investigative activities was finalized. The off-site and on-site RIW tasks were outlined in Metcalf & Eddy, Inc. (1984) and are modified in Appendix A of the Consent Order. The Phase 1 RIW tasks are detailed in Hargis + Associates, Inc. (1986a, 1986b, 1986d, 1986e). The tasks were designed to obtain information necessary to support a feasibility study.

The Phase 1 off-site remedial investigation was conducted from April 1986 to January 1987. Forty-three 5-foot soil borings were constructed around the perimeter of the site, in the LADWP right-of-way, and in the Normandie Avenue ditch. Soil samples were collected at 1-foot intervals and analyzed for all Target Chemicals. Surface soil samples were collected in the surrounding neighborhood at 17 sites located on 1/2- and 3/4-mile radii for analysis of pesticides. Sediment samples for Target Chemical analysis were collected at 25 locations in the Kenwood Drain, Torrance Lateral, Dominguez Channel, and Consolidated Slip. Dry weather surface water samples for Target Chemical analysis were collected at 18 locations in the Torrance Lateral, Dominguez Channel, and Consolidated Slip. Wet weather surface water samples were collected at 20 locations in the drainages from the Normandie Avenue ditch to the Consolidated Slip.

The Phase 1 on-site remedial investigation was conducted from September 1986 to January 1987. The on-site work consisted of soil sampling in the vicinity of the former surface impoundment and construction of eight monitor wells in two hydrogeologic units. Twenty-five soil samples were collected for Target Chemical analysis from four 60-foot soil borings. Two exploratory borings were drilled to approximately 220 feet bls. Four of the monitor wells were screened in the Bellflower sand unit between approximately 105 and 125 feet bls. Three of the monitor wells were screened in the Gage aquifer between approximately 145 and 165 feet bls. A fourth monitor well was screened at the base of the Gage aquifer between approximately 185 feet and 205 feet bls. Two groundwater sampling rounds were conducted in January 1987 per the terms described in the technical appendix of the Consent Order. Additional sampling rounds were conducted in February, March, and November 1987, and in January and April 1988. All groundwater samples were analyzed for the Target Chemicals. Results of the Phase 1 off-site and on-site remedial investigation are contained in a series of field data and analytical data submittal reports (Hargis + Associates, Inc., 1986c, 1986f, 1986g and 1987a through 1987l).

On October 28, 1987, Montrose and the EPA agreed to modify and expand the technical tasks described in Appendix A of the Consent Order. The additional tasks are referred to as Phase 2A of the RIW. This sampling plan documents the methodology which will be used in carrying out the agreed-on tasks. Phase 2A will be performed for Montrose under the direction and supervision of Hargis + Associates, Inc. subject to the review and approval of the EPA.

ASSESSMENT OBJECTIVES

The objectives of the Phase 2A remedial investigation are to complete the assessment of on-site and off-site soil for the presence of Target Chemicals, to complete the assessment of off-site sediment deposits in Dominguez Channel for the presence of total DDT and total BHC, and to further determine the presence of Target Chemicals in the groundwater that may have resulted from activities at the Montrose site. The assessment will provide sufficient data of acceptable quality to support the Feasibility Study. The quality of data will be ensured by following the sampling protocols described in the QAPP.

The specific objectives of the Phase 2A on-site and off-site soil and sediment assessment are to:

.. Further define the horizontal and vertical distribution of Target Chemicals in soil in the vicinity of the former surface impoundment.

.. Further define the horizontal and vertical distribution of Target Chemicals beneath the Normandie Avenue ditch.

.. Further define the horizontal and vertical distribution of non-volatile Target Chemicals along the SPRR right-of-way, the LADWP right-of-way, and a historical drainage located on the north portion of Farmer Bros. property.

.. Determine the distribution and approximate volume of sediment in the Dominguez Channel in the vicinity of the Torrance Lateral discharge.

.. Further define the distribution and concentration of nonvolatile Target Chemicals in the Dominguez Channel in the vicinity of the Torrance Lateral discharge.

The specific objectives of the Phase 2A groundwater assessment are to:

.. Determine the depths, thicknesses and lateral continuity of the Bellflower aquitard and the Gage aquifer in the vicinity of the site.

.. Further define the direction of groundwater flow in the Bellflower aquitard and the Gage aquifer.

.. Further define the chemical quality of the water in the Bellflower aquitard and Gage aquifer.

.. Obtain water level and water quality information in the Gage aquifer in the immediate vicinity of the former surface impoundment.

.. Provide data to determine where the Lynwood aquifer should be investigated.

.. Obtain water level and water quality data regarding the Lynwood aquifer.

TARGET CHEMICALS

The Target Chemicals for the RIW were selected by the EPA based on on-site soil analyses conducted in June 1985. The Target Chemicals are:

- Total DDT, including all isomers, DDD, and DDE
- Total BHC, including all isomers
- Monochlorobenzene
- Dichlorobenzene
- Benzene
- Chloroform
- Acetone

Although not required under the order, groundwater samples from newly constructed monitor wells will also be analyzed for common ions to aid in interpreting site hydrogeologic conditions. Laboratory methods, handling, and preservation procedures for groundwater soil and sediment samples are summarized in the QAPP.

LABORATORY ANALYSES

Groundwater and on-site soil samples collected during Phase 2A will be analyzed for the Target Chemicals **(Table 1)**. EPA Methods 608 and 624 will be used for analysis of groundwater samples and EPA Methods 8080 and 8240 will be used for analysis of soil samples. Common ion analyses will also be conducted on the groundwater samples.

All off-site soil and sediment samples will be analyzed for DDT and BHC using EPA Method 8080. Analysis for VOC's will be conducted on soil samples collected from the Normandie Avenue ditch if the presence of VOC's is indicated as a result of field VOC screening tests. Field test method procedures are described in Section 6.3, Page 37 of the QAPP. EPA Method 8240 will be used for VOC analysis of soil samples.

Groundwater, soil, and sediment sample handling, preservation, laboratory method detection limit (MDL) and analytical methods are summarized in **Table 1** and described in detail in Sections 5.4, Page 24, Section 7.0, Page 39, and Section 9.0, Page 45 of the QAPP. Actual detection limits may be greatly affected by high concentrations of other compounds. Analyses will be performed by Brown & Caldwell Laboratories, Pasadena, California. Laboratory check samples collected during groundwater sampling rounds will be analyzed by Analytical Technologies, Inc., San Diego, California.

QUALITY ASSURANCE

The objective of a quality assurance (QA) program is to provide data for which the limits of uncertainty are known and from which sound conclusions may be drawn. Proper documentation will provide records of traceability and adherence to prescribed protocols.

The QA program is described in detail in the accompanying QAPP, and will provide for complete documentation of all sampling activities. Sample activities include field measurements and the calibration of instruments, sampling techniques, preservation procedures, documentation of sample quality using blanks and duplicates, chain-of-custody records, packaging, shipping, and handling procedures, analytical methods, and laboratory quality control procedures.

Provisions for split samples for all sampling activities will be made. The EPA and the RWQCB will be notified at least 20 days prior to commencement of field sampling to allow mobilization of their sampling team and selection of laboratory. The EPA will provide its own split sample containers. If necessary, Montrose will provide split sample containers for the RWQCB. Close coordination with the EPA and its contractors will be maintained throughout Phase 2A field activity.

Duplicate soil, sediment, and groundwater samples will be collected during each sampling round. EPA split samples will be provided to the EPA and its contractor for analysis at an EPA Contract Laboratory. Duplicate soil, sediment, and groundwater samples will be provided to Brown & Caldwell Laboratories, Pasadena, California. Duplicate groundwater samples, referred to as laboratory check samples, will be provided to Analytical Technologies, Inc. Laboratory, San Diego, California as described in Section 5.3, Page 13 of the QAPP. Rationale for the location of groundwater, soil, and sediment field duplicate and laboratory check samples is discussed on **Page 31, Groundwater Sampling Procedures**, and on **Page 45, Soil and Sediment Sampling Procedures**.

HYDROGEOLOGIC CONDITIONS

The Montrose site is located in the West Coast Basin on the Torrance Plain in Los Angeles County, California (California Department of Water Resources, 1961). The California Department of Water Resources (CDWR) describes the principal hydrogeologic units in the area as the Bellflower aquitard and the Gage, Lynwood and Silverado aquifers. These units are general in nature and have been designated for a study area covering hundreds of square miles based on similarities in lithology. Lithologic units encountered during on-site drilling have been correlated to these general units based on similar lithology, depth of occurrence, thickness and sequence.

BELLFLOWER AQUITARD

The following discussion is based on information collected during Phase 1 on-site monitor well construction and exploratory boring activity. The Bellflower aquitard is the shallowest water-bearing hydrogeologic unit encountered underneath the Montrose site. It extends from approximately 65 feet bls to approximately 140 feet bls. Aquitard thickness is variable but is approximately 75 feet. Based on lithology, the aquitard can generally be divided into three subunits. The upper sub-unit is informally referred to in this plan as the upper Bellflower aquitard. The intermediate sub-unit is informally referred to in this plan as the Bellflower sand. The lower subunit is informally referred to in this plan as the lower Bellflower aquitard.

Upper Bellflower Aquitard

The upper contact of the upper Bellflower aquitard has been encountered at depths between 56 and 81 feet bls. The lower contact has been encountered at depths between 100 and 115 feet bls. The observed thickness of the sub-unit ranges from approximately 20 to 50 feet. The upper Bellflower aquitard consists of interbedded fine-grained sand, clayey sand, silty sand, and silt.

Bellflower Sand

The upper contact of the Bellflower sand has been encountered at depths between 100 and 115 feet bls. The lower contact has been encountered at depths between 125 and 130 feet bls. The observed thickness of this sub-unit ranges from approximately 11 to 26 feet. The Bellflower sand is a fine- to medium-grained sand containing few fines and is typically yellowish in overall color. The Bellflower sand often contains multi-colored, fine to medium, moderately well-rounded grains. Based on grain size distribution, water level recovery from development pumping, and drawdown during groundwater sampling, the Bellflower sand appears to have the greatest hydraulic conductivity of the units encountered on-site.

Lower Bellflower Aquitard

The upper contact of the lower Bellflower aquitard has been encountered at depths between 125 and 130 feet bls. The lower contact has been encountered at depths between 131 and 150 feet bls. The known thickness of this sub-unit ranges from approximately 5 to 19 feet. The lower Bellflower aquitard is often comprised of two silt or clay layers separated by approximately 5 feet of fine-grained sand and silty sand.

GAGE AQUIFER

The following discussion is based on information collected during Phase 1 on-site monitor well construction and exploratory boring activity. The Gage aquifer immediately underlies the Bellflower aquitard. The upper contact of the Gage aquifer has been observed at depths between 131 and

150 feet bls. The lower contact has been observed at depths between 201 and 217 feet bls. The observed aquifer thickness ranges from approximately 63 feet to 78 feet. The Gage aquifer consists of very fine-grained sand with a silt content that generally increases with increasing depth. The upper portion of the aquifer is a clean sand which gradually changes to a silty sand near the base. Lithologic samples from the Gage aquifer are typically gray or bluish gray in color.

LYNWOOD AQUIFER

The following discussion is based on information from CDWR, (1961) and the log from Los Angeles County Flood Control District (LACFCD) well no. 795 located at the Jones Chemical Company facility (LACFCD, 1948). The Lynwood aquifer underlies the Gage aquifer and is typically separated from it by an unnamed clayey aquitard. Based on isopach and equal elevation maps for the Lynwood aquifer (CDWR, 1961) and the lithologic log from well no. 795, the upper contact of the Lynwood aquifer may occur at a depth of approximately 250 feet bls. The Lynwood aquifer isopach map and general geologic cross sections (CDWR, 1961) indicate that the aquifer is 75 to 110 feet thick. However, the lithologic log from well no. 795 suggests an aquifer thickness of 34 feet. The Lynwood aquifer material has been described as a coarse sand and gravel.

DIRECTION OF GROUNDWATER FLOW

Water table elevations measured in wells completed in the upper Bellflower aquitard on-site and in similarly constructed wells on other properties undergoing groundwater assessment indicate the direction of groundwater flow in this unit is presently to the southeast **(Table 2; Figure 2)**. Hydrogeologic conditions at sites in the vicinity of Montrose are described by BCL Associates, Inc. (1987), Dames and Moore (1984), Ecology and Environment, Inc. (1983), R.L. Stollar and Associates, Inc. (1987), and

Woodward-Clyde Consultants, Inc. (1987a and 1987b). Water level elevations in on-site wells completed in the Bellflower sand and the Gage aquifer suggest an east to southeast direction of flow in these units **(Figures 3 and 4)** (Hargis + Associates, Inc., 1987h).

The direction of groundwater flow in the Lynwood aquifer can only be inferred from the following limited information: 1) the on-site horizontal hydraulic gradient in the overlying Gage aquifer; 2) the range of historical regional groundwater flow directions in the underlying Silverado aquifer; and 3) knowledge of the location of major groundwater pumping and injection centers in the West Coast Basin. There are no known wells in the area that exclusively tap the Lynwood aquifer. At the Montrose site, groundwater flow directions in the Gage aquifer generally appear to be toward the east and southeast. Various regional Silverado aquifer water level elevation maps published by the CDWR and the LACFCD indicate the direction of flow has varied between north and southeast. The presence of the West Coast Basin injection barrier located along the coastline, the regional groundwater pumping centers located north, east and southeast of the site (CDWR, 1986), and the absence of local groundwater pumping suggest that the groundwater flow direction in the Lynwood aquifer in the vicinity of the Montrose site may have an eastward component.

HYDROGEOLOGIC ASSESSMENT

During the Phase 2A investigation, 10 groundwater monitor wells will be completed in the upper Bellflower aquitard, four monitor wells will be completed in the Bellflower sand, five monitor wells will be completed in the Gage aquifer, and at least one monitor well will be completed in the Lynwood aquifer in the vicinity of the Montrose site. The monitor wells will be constructed to aid in evaluation of geologic conditions and to further define the direction of groundwater flow. Additionally, monitor wells will be constructed to further define the chemical quality of the groundwater in the upper Bellflower aquitard, Bellflower sand and Gage aquifer and to initially define the chemical quality of the groundwater in the Lynwood aquifer. Up to five exploratory borings will be drilled prior to the construction of the Bellflower sand and Gage and Lynwood aquifer monitor wells. The number of exploratory borings may be reduced depending upon results from the first three Phase 2A exploratory borings. The additional geologic data obtained from the borings will be used to develop the final design of the monitor wells and to support the feasibility study.

A map indicating the locations of the proposed exploratory borings and proposed monitor wells along with the locations of the existing monitor wells has been prepared **(Figure 5)**. Lynwood aquifer monitor well depths and locations have not yet been determined and are therefore not shown on the figure. Appropriate locations and design for any Lynwood wells will be developed after lithologic, water level, and water quality data are available from the off-site Bellflower and Gage monitor wells.

Six off-site upper Bellflower aquitard wells will be constructed in the vicinity of the Montrose site. In addition, four monitor well clusters will be located generally downgradient on a radius of approximately 1,100 feet from the center of the site. Each well cluster will comprise an upper Bellflower aquitard monitor well, a Bellflower sand monitor well, a Gage aquifer monitor well and an exploratory boring. The proposed well clusters are located to further define the direction of groundwater flow and the chemical quality of each of the monitored hydrogeologic units. The fifth Gage aquifer monitor well will be located on-site in the vicinity of the former surface impoundment.

LITHOLOGIC LOGGING

Well logs will be prepared in accordance with Section 6.1, Page 33 of the QAPP, for each exploratory boring and monitor well drilled. These logs will include description of color, mineral composition, and degree of induration of the materials encountered. Records of penetration rates, drilling fluid characteristics, casing schedules, and other pertinent observations will be recorded. All drilling and logging will be supervised by an experienced geologist.

EXPLORATORY BORINGS

The objectives of the exploratory boring program are to verify the lithology encountered during Part 2, Phase 1 RI drilling at the Montrose site and Del Amo hazardous waste site and to efficiently locate the lithologic contacts of the upper Bellflower aquitard, Bellflower sand, and Gage and Lynwood aquifers in order to expedite the well installation process.

It is proposed that exploratory borings EB-2A and EB-3 through EB-6 be drilled through the Lynwood aquifer, or if the Lynwood aquifer is not encountered, to a maximum depth of 350 feet bls **(Figure 5)**. Regional data suggest that the Lynwood aquifer, if present in the vicinity of the Montrose site, would be encountered within the proposed maximum depth range of 350 feet. No more than three exploratory borings will be drilled if sufficient data have been gathered to reasonably predict the hydrogeologic contacts in the vicinity of the other two proposed well clusters.

At a minimum, exploratory borings EB-2A, EB-3, and EB-5 will be drilled and logged. Exploratory boring EB-2A will be drilled on-site adjacent to the Phase 1 exploratory boring EB-2. The purpose of boring EB-2A is to determine the thickness and lithologic character of the Lynwood aquifer and the overlying aquitard. Exploratory borings EB-3 through EB-6 will be drilled at each of the four off-site monitor well clusters. Boring EB-3 will be drilled at the northernmost monitor well cluster on the Jon Street cul-de-sac. The Jon Street well cluster location is farthest from the previously drilled exploratory borings EB-1 and EB-2. The proposed location for boring EB-5 is the Western Refuse, Inc. property on the east side of Normandie Avenue, north of the unpaved Del Amo Boulevard. Based on current water table information, this location is directly downgradient from the Montrose site. Optional exploratory borings EB-4 and EB-6 are proposed to identify the lithology and hydrogeologic intervals on the LADWP right-of-way east of Normandie Avenue and on the Farmer Bros. property south of the Montrose site, respectively.

A nominal 4-inch borehole will be drilled with the fluid rotary method. The small-diameter exploratory borehole provides an efficient means of identifying lithologic units for well design. A lithologic description of formation materials encountered during drilling will be recorded in the field book according to the procedures described in Section 6.1, Page 33 of the QAPP. Geophysical logs consisting of spontaneous potential, point resistivity, and 6-foot lateral resistivity will be run in each borehole. The geophysical logs obtained from the exploratory borings will further define the depths to the hydrogeologic contacts. The exploratory borings will be abandoned upon completion of geophysical logging activities by pressure grouting with neat cement from the bottom of the boring using a tremie pipe. Neat cement will be mixed using 5 to 6 gallons of water per sack of cement.

UPPER BELLFLOWER AQUITARD MONITOR WELLS

The proposed upper Bellflower aquitard monitor wells will further define the direction of groundwater flow and the chemical quality of groundwater in the Bellflower aquitard off-site. Monitor well MW-8 will be located to provide data in the apparent upgradient direction from the former surface impoundment. The locations of monitor wells MW-6, MW-7, and MW-10 have been selected to provide data on water levels and chemical quality of groundwater transverse to the present direction of groundwater flow. These wells will provide data on the extent of lateral migration of Target Chemicals. Monitor well MW-9 is proposed to provide water level and water quality data directly upgradient from monitor well MW-5. The location of monitor well MW-11 has been selected to provide additional water level and water quality information downgradient from monitor well MW-5. Monitor wells MW-12 through MW-15 are each located at one of the four off-site downgradient well clusters (Figure 5).

Well Design And Construction Materials

Proposed monitor well dimensions, construction materials, drilling techniques, well development, pump selection and pump installation are described herein. Because variable geologic conditions and associated drilling difficulties cannot always be anticipated, some adjustment to the proposed procedures may be required. If any such changes are necessary they will be discussed with EPA and its technical advisors whenever possible.

The approximate depth of the water table at the Montrose site is 70 feet bls. Upper Bellflower aquitard monitor wells will be screened between approximately 65 and 80 feet bls (Figure 6). Screened intervals may require adjustment based on well site elevation and current water level data. The proposed screened interval will provide water level and water quality information comparable to that provided by previously constructed upper Bellflower aquitard monitor wells MW-1 through MW-5.

Fifteen feet of nominal 4-inch diameter 316 or 316L stainless steel screen will be installed in each well. Stainless steel well screen and casing will be steam cleaned prior to installation. Nominal 4-inch, flush-threaded schedule 40 PVC blank casing will be installed above the screen to land surface. Based on sieve analyses of representative samples from the upper Bellflower aquitard, the anticipated screen slot size and filter pack size are 0.10 inches and U.S. sieve numbers 30-50, respectively. These sizes may be adjusted subject to field conditions or product availability. The filter pack will be installed to approximately 2 feet above the screen. A bentonite seal will be placed over the filter pack by pouring 5 to 10 gallons of granular bentonite down the well annulus. Because the bentonite will be located above the water table it will be hydrated with 5 to 10 gallons of tap water. Approximately 2 feet of very fine-grained sand will be placed above the bentonite seal to further prevent the grout from entering the screened interval. A grout mixture will seal the well annulus from the grout filter to land surface. A cement-sand slurry with 5 to 6 gallons of water per sack of cement will be used. The cement-sand slurry will be added at the surface to the annular space between the well casing and the auger stem. The slurry will be placed in lifts as the hollow auger is removed. Concrete utility vaults with vandal resistant, traffic-worthy steel lids will be installed at the surface over each well. Inside the utility vault the wellhead will be secured with a padlock. Vaults will be set a minimum of 1 inch above grade to minimize entry of surface water.

Drilling Techniques

A hollow stem auger drill rig will be used to construct the upper Bellflower aquitard monitor wells. The borings will be lithologically logged by inspecting auger cuttings and soil samples obtained from drive samplers and core barrels according to the borehole logging techniques outlined in Section 6.1, Page 33 in the QAPP. The boreholes will be drilled with a 6-1/2 inch or 8-1/4 inch inside diameter (I.D.), or 10-1/4 inch or 12-1/4 inch outside diameter (O.D.) hollow stem auger. The drill bit may be equipped with a wooden plug to prevent flowing sand from entering the inside of the hollow stem auger.

Filter pack and seal materials will be placed by gravity by adding them directly into the annulus between the well casing and the hollow stem auger. To prevent filter pack bridging inside the hollow stem, the auger will be slowly lifted from the hole as the filter pack is emplaced.

Drilling equipment will be steam cleaned between upper Bellflower monitor wells according to the decontamination procedure described in Section 5.2, Page 12 of the QAPP.

The hollow stem auger drilling method can be a rapid and effective means of collecting soil samples and installing shallow monitor wells under certain conditions. However, several limitations to the hollow stem auger method should be noted. The primary limitations of the method are the potential for cross-contamination when drilling through multiple hydrogeologic units, difficulties relating to flowing sand, and limited drilling depth.

Hollow stem auger drilling can result in the cross-contamination of hydrogeologic units. The augered borehole is an improved hydraulic conduit from one hydrogeologic unit to another because there is no wallcake or other means to isolate the boring from the hydrogeologic environment. Where a downward vertical gradient exists and where a contaminated hydrogeologic unit overlies an uncontaminated or less contaminated unit, cross-contamination may result if a hollow stem auger is used to construct a monitor well in the lower unit. The potential for cross-contamination of hydrogeologic units limits the use of this method at the Montrose site to construction of the upper Bellflower aquitard monitor wells.

In contrast to the hollow stem auger method, boreholes drilled using fluid rotary methods generally do not provide hydraulic conduits between hydrogeologic units. This is due to the greater hydrostatic pressure in the borehole compared to that in the formation and to the low-permeability wallcake on the borehole wall, which isolates the boring from the hydrogeologic environment. The limited possibility of cross-contamination can be further reduced by using fresh drilling fluid when drilling the interval to be screened.

Flowing sand conditions may occur while using the hollow stem auger method in unconsolidated sand below the water table. The problem is due to a difference in hydraulic head between the inside of the hollow stem auger and the formation outside the auger bit. The difference in hydraulic head exists when the hollow stem auger bit is below the water table and the inside of the auger is dry, or when soil samplers are pulled out of the saturated formation into the hollow stem, thereby creating suction. When the inside of the hollow stem auger is in hydraulic communication with the bottom of the boring, such as when the continuous core barrel is removed, water may flow into the auger flights. When this occurs in some unconsolidated sand formations, the sand may liquify and also flow into the hollow stem auger. Core sampling is not possible when sand flows into the hollow stem auger because the sand interferes with the normal placement of the continuous core barrel within the auger bit. Similarly, proper placement of well casing or screen during well construction may not be possible because of sand inside the auger. Flowing sand conditions can also result in the permanent abandonment of auger flights which have become sand-locked in the boring.

During previous on-site drilling at the Montrose site, approximately 140 feet of hollow stem auger became sand-locked in monitor well LG-1 due to flowing sand. Two days were required to successfully remove the auger from the borehole. At an unrelated Hargis + Associates, Inc. project in the Los Angeles County West Coast Basin, approximately 60 feet of hollow stem auger became sand-locked and abandoned after attempted soil sampling below the water table resulted in sand flowing into the auger.

In a report by Woodward-Clyde Consultants, Inc. (1987a), a description of drilling activities at the nearby Del Amo hazardous waste site indicated that flowing sand in the upper Bellflower aquitard was a serious problem when the hollow stem auger method was used for soil sampling and monitor well completion below the water table. Eventually, all monitor wells constructed by Woodward-Clyde Consultants, Inc. at the Del Amo site were completed using fluid rotary methods.

In some cases the potential for flowing sand conditions can be minimized if the hydraulic head difference between the inside of the auger and the bottom of the boring can be reduced or reversed. One way to minimize the hydraulic head difference is to limit the depth penetrated below the water table. A second way to minimize or reverse the hydraulic head difference is to add fresh tap water inside the hollow stem auger to overcome the hydrostatic pressure outside the auger.

Auger submergence will be limited during construction of upper Bellflower aquitard wells because the monitor wells will only be drilled to approximately 10 feet below the water table. To reduce the tendency for sand to flow, it may be necessary to add fresh tap water to the augers. This will maintain a water level inside the auger which is higher than the water table outside the auger. The amount of fresh tap water introduced will be kept to a minimum. Approximately 20 gallons of water are necessary to fill the hollow stem auger to the required level. Previous experience indicates that several times that volume may actually be required to maintain an adequate water level inside the auger during well construction. No more than 250 gallons of fresh tap water, the approximate equivalent of one hollow stem auger volume, will be added to stabilize the borehole during monitor well construction. As soon as possible after well completion, a volume of water greater than the volume of water added during completion will be removed from the well.

If fresh tap water is used to stabilize the hollow stem auger boring and the water is transferred to the drilling site by a water truck, a water sample will be collected from the truck and analyzed using EPA Methods 608 and 624. The analytical results from the water samples will be used to provide quality control on the chemical quality of water added to the borehole during construction of the upper Bellflower aquitard monitor wells.

If flowing sand prevents completion of the monitor wells using the hollow stem auger method as described herein, fluid rotary drilling techniques will be used to stabilize the borehole and to complete the monitor wells. Rotary drilling techniques for the Bellflower sand monitor wells are discussed on **Page 25, Drilling and Pressure Grouting**.

Well Development

Following completion, each upper Bellflower aquitard monitor well will be swabbed and bailed until the production of fine-grained sediments is minimal. If well capacity is sufficient, final development will be achieved by installing a temporary submersible pump and pumping until the discharge clears. If these development methods prove ineffective, airlifting is a possible alternative. If development remains inadequate, additional alternatives will be discussed with the EPA prior to implementation. Discharge rates will be estimated volumetrically. Water level recovery will be measured and recorded after development.

Pump Selection and Installation

Groundwater samples will be collected with dedicated, gas-activated bladder pumps. All pump components that may be exposed to sample water, including the discharge tubing, will be constructed of either stainless steel or teflon. The sampling pump will be a Well Wizard^{R}, Timco^{TM}, or an acceptable equivalent pump. The pump will be selected based on price, availability, and compatibility with existing project equipment. The sampling pump will be operated at low discharge rates during sampling to minimize sample volatilization. Depending upon the well specific capacity during development, a dedicated gas-displacement pump may be installed above the sampling pump in the upper Bellflower aquitard wells to purge the wells prior to sampling.

BELLFLOWER SAND MONITOR WELLS

A map indicating the locations of proposed Bellflower sand monitor wells BF-5 through BF-8 along with the locations of existing Bellflower sand monitor wells BF-1 through BF-4 has been prepared **(Figure 5)**. Each proposed Bellflower sand monitor well is located at one of the four off-site well clusters.

Well Design and Construction Materials

Proposed well dimensions and construction materials, drilling techniques, well development and pump selection and installation are described herein. Because varying geologic conditions and drilling difficulties cannot be fully anticipated, some adjustment to the proposed procedures may be required.

Bellflower sand monitor wells will be screened between approximately 115 and 125 feet bls **(Figure 7)**. The proposed screened intervals may require adjustment based on well site elevation and exploratory boring results. It is expected that this screened interval will provide water level and water quality data comparable to that provided by previously constructed Bellflower sand monitor wells BF-1 through BF-4. Ten feet of nominal 4-inch diameter 316 or 316L stainless steel screen with 10 feet of 4-inch diameter stainless steel blank casing will be installed in each monitor well. Stainless steel well screen and casing will be steam cleaned prior to installation. Nominal 4-inch diameter flush-threaded schedule 40 PVC casing will be installed from the blank stainless steel casing to land surface. Centralizers will be set at approximately 115 feet bls and 125 feet bls. Based on sieve analyses of representative samples from the Bellflower sand, the anticipated screen size and filter pack size are 0.045 inches and U.S. sieve numbers 6-16, respectively. These sizes may be adjusted subject to field conditions or product availability. The filter pack will be installed to approximately 2 feet above the screen. Approximately 2 feet of fine-grained sand will be placed over the filter pack as a grout filter. A bentonite grout mixture such as Volclay Grout by American Colloid or Benseal by NL Baroid will be placed between the well casing and the conductor casing to seal the well from the grout filter to land surface. A tremie pipe will be used for placement of the grout. Concrete utility vaults similar to the vaults proposed for the upper Bellflower aquitard monitor wells will be installed.

Drilling and Pressure Grouting

To ensure isolation of the Bellflower sand from the overlying upper Bellflower aquitard, 8- to 10-inch I.D. mild steel conductor casing will be set from land surface to approximately 100 feet bls. Fluid rotary drilling methods will be used to drill the 12-1/2 to 15-inch diameter boring necessary to accommodate the conductor casing. Neat cement mixed with 5 to 6 gallons of water per sack of cement will be placed in the annular space between the conductor casing and borehole wall by pressure grouting through the bottom of the conductor casing. After installation of the conductor casing, new mud will be mixed and the interval to be screened will be drilled using an 8- to 10-inch nominal size bit. Drilling fluid will be made from a natural high-grade bentonite such as NL Baroid's Quik-Gel or an equivalent. Drilling equipment will be steam cleaned between well clusters according to the decontamination procedures described in Section 5.2, Page 12 in the QAPP.

Well Development

After the casing is installed, each Bellflower sand monitor well will be swabbed and bailed until the production of fine-grained sediments is minimal. Final development will be achieved by installing a temporary submersible pump and pumping until the discharge clears. If these development methods prove ineffective, airlifting is a possible alternative. If development remains inadequate, additional alternatives will be discussed with EPA prior to implementation. Discharge rates and groundwater level recovery will be measured during and after development.

Pump Selection and Installation

Stainless steel dedicated electric submersible pumps will be used to purge each Bellflower sand monitor well. Pump selection will be based on discharge rates measured during development. Groundwater samples will be collected with dedicated gas-activated bladder pumps. All pump components that may be exposed to sample water, including the discharge tubing, will be constructed of either stainless steel or teflon. The sampling pump will be placed approximately 10 feet above the top of the screen and approximately 10 feet below the electric submersible pump. Final pump locations will be based on well response during development. The sampling pump will be a Well Wizard®, Timco™ or an acceptable equivalent pump. The sampling pump will be selected based on price, availability, and compatibility with existing project equipment. The sampling pump will be operated at low discharge rates during sampling to minimize sample volatilization.

GAGE AQUIFER MONITOR WELLS

Five Gage aquifer monitor wells are proposed for the Phase 2A groundwater assessment **(Figure 5)**. Gage aquifer monitor wells G-4 through G-7 will be located at the four off-site well clusters. Monitor well LG-2 will be located near the former surface impoundment to obtain water levels and groundwater data concerning the Gage aquifer in the vicinity of the impoundment.

Monitor wells G-4 through G-7 are intended to provide water quality and water level elevation data at off-site locations downgradient from the Montrose site. Water quality data from proposed monitor well LG-2 and Phase 1 monitor well LG-1 will indicate whether Target Chemical concentrations in the lower part of the Gage aquifer are likely to increase in an upgradient direction between well LG-1 and the former surface impoundment. Water quality and water level elevation data from wells LG-1 and LG-2 will be used, in conjunction with data from monitor wells G-1 through G-7 to select Lynwood aquifer monitor well locations.

Drilling methods, well construction methods and materials, well development methods, and pumping equipment for Gage aquifer monitor wells will be the same as those proposed for the Bellflower sand monitor wells. However, monitor wells G-4 through G-7 will have conductor casing installed to approximately 140 feet bls and will be equipped with 40 feet of stainless steel screen set between approximately 150 and 190 feet bls **(Figure 8)**. Monitor well LG-2 will have conductor casing installed to approximately 185 feet bls and will be equipped with 20 feet of stainless steel screen set between approximately 190 and 210 feet bls **(Figure 9)**. Based on sieve analyses of representative samples from the Gage aquifer, the anticipated screen slot size and filter pack are 0.020 inches and U.S. sieve numbers 8-20, respectively. These sizes may be adjusted subject to field conditions or product availability. Proposed screened intervals for Gage aquifer monitor wells may require adjustment based on well site elevation and exploratory boring results.

LYNWOOD AQUIFER MONITOR WELLS

Initial assessment of the Lynwood aquifer is proposed during the Phase 2A field investigation. After completion of the exploratory borings and the installation of the proposed Phase 2A monitor wells in the overlying hydrogeologic units, the number and locations of Lynwood aquifer monitor wells will be determined based on an evaluation of the preliminary hydrogeologic and analytical data. A summary of the preliminary hydrogeologic and analytical data along with the rationale for the proposed Lynwood aquifer monitor locations will be submitted in a memorandum to the EPA prior to well installation.

Selection of Lynwood aquifer monitor well locations will be based on three criteria: 1) Target Chemical concentrations in the lower portion of the Gage aquifer; 2) aquitard competency as inferred from data; and 3) the inferred groundwater flow direction in the Lynwood aquifer.

The distribution of Target Chemical concentrations in the lower portion of the Gage aquifer will be inferred from analyses of water samples from monitor wells completed in the upper and lower portions of the Gage aquifer. Evaluation of the competency of the aquitard between the Gage and Lynwood aquifer will be based on lithologic and geophysical logs generated from the exploratory borings. This evaluation will consider aquitard thickness, lithology, frequency and thickness of possible sand interbeds and stratigraphic correlation of lithologic features. The probable eastward component of groundwater flow in the Lynwood aquifer, discussed on **Page 14, Hydrogeologic Conditions**, will be considered when selecting Lynwood aquifer monitor well locations.

The approximate depth to and thickness of the Lynwood aquifer will be determined by reviewing the lithologic and geophysical logs from the proposed exploratory borings. Details of well drilling methods, well construction methods and materials, well development and pump selection and installation for Lynwood aquifer monitor wells are generally the same as those proposed for the Bellflower sand and Gage aquifer monitor wells. Well screen slot size and filter pack will be determined from sieve analyses of drill cuttings of the Lynwood aquifer.

GROUNDWATER SAMPLING PROCEDURES

Groundwater samples will be collected from each monitor well in accordance with the procedures outlined in Section 5.3, Page 13 of the QAPP. The proposed groundwater sampling program has been summarized in Table 3. The wells will be pumped until at least three casing volumes of fluid are removed from the wells or until electrical conductance (EC), pH, and temperature have stabilized. Frequent measurements of EC, pH, and temperature of the well discharge will be taken to verify that these parameters have stabilized prior to collection of samples.

During each sampling round, Hargis + Associates personnel will:

1. Measure the water level with an electric sounder or steel tape to the nearest 0.01 foot.

2. Pump the well until at least three casing volumes have been removed or EC, pH, and temperature have stabilized prior to collecting samples.

3. Collect groundwater samples from the bladder pump discharge tube in the appropriate sample containers as described in Section 5.3.1, Page 15 of the QAPP. Rinse nonpreserved sample containers with the well discharge prior to sample collection and label properly in the field. Pesticide and other preserved containers will not be pre-rinsed.

4. Record all pertinent data, in a field notebook during each sampling round, and sign and date the field notebook. Pertinent data include:

   .. Depth to static water level.
   .. The time that pumping begins.
   .. The time of sample collection.
   .. The pump discharge rate.
   .. The field parameters pH, EC, and temperature.
   .. The time that pumping stops.

Further details on the groundwater sampling procedures are contained in Section 5.3.1, Page 13 and Section 5.4.1, Page 24 of the QAPP.

Frequency of Sampling

An initial water sample will be collected from each monitor well after installation of the pumps. A second water sample will be collected approximately two weeks after the initial sampling. As agreed upon by the EPA and Montrose, groundwater sampling will be performed on a quarterly basis following the two initial sampling rounds. Quarterly sampling will be conducted by Montrose for the following year to evaluate changes in water quality with time. Data from these rounds will be used to determine and appropriate schedule for future sampling rounds.

Field Measurements and Equipment Requirements

Field measurements collected during the sampling activities will include water level measurements, discharge rates, EC, temperature, and pH. A pH meter, conductivity meter and field thermometer will be used when purging monitor wells to assist in the collection of representative groundwater samples. To ensure accuracy, the instruments will be calibrated periodically as outlined in Section 6.3, Page 35 and Section 8.0, Page 43 of the QAPP. Probes will be thoroughly rinsed with distilled water before each measurement. All field measurements will be recorded in a field notebook.

Sample Containers

Water samples for analysis of common ions will be collected in 1-liter polyethylene bottles **(Table 4)**. The bottles will be thoroughly rinsed with water pumped from the monitor well prior to sample collection. Temperature and electrical conductivity will be measured in the field at the time of the sampling in a separate, thoroughly rinsed container utilizing a separate portion of sample water which will not be submitted for analysis.

Water samples for analysis of VOC's will be collected in two 40-ml glass vials with teflon-lined threaded caps. All vials will be completely filled with water to ensure zero head space, as described in detail in Section 5.3.1, Page 16 of the QAPP. All water sample containers will be taped, labeled and placed in an ice chest on ice until the analyses are performed.

Water samples for analysis of DDT and its metabolites will be collected in 1-liter amber colored glass bottles sealed with teflon-lined caps. All water sample containers will be taped, labeled, and placed in ice chests on ice until the analyses are performed. See Section 5.4.1, Page 24 of the QAPP for details on groundwater sample container preparation.

Quality Assurance Samples

Groundwater sampling locations for field duplicate sample collection, laboratory check sample collection, and field blank sample preparation have been selected to provide a spatially distributed set of QA/QC samples. Field duplicate groundwater samples will be collected from monitor wells screened in each representative depth interval. Laboratory check sample collection and field blank sample preparation will be conducted at the same sample location as the field duplicate groundwater samples. Sample collection frequencies are summarized for each quality assurance sample type **(Table 5)**.

SOIL AND SEDIMENT ASSESSMENT

Phase 2A field activities will also include soil sampling, sediment thickness surveys and sediment sampling. Soil samples for laboratory analysis will be collected on- and off-site **(Table 3; Figure 10)**. A sediment thickness survey and sediment sampling will be conducted in Dominguez Channel **(Figure 11)**. Lithologic descriptions of soil and sediment samples will be recorded. The precise soil sampling, sediment survey and sediment sampling locations may have to be adjusted in the field to accommodate field equipment, underground utilities, tidal conditions, or other unforeseeable field problems. Sampling locations may also be subject to change pending approval to enter off-site properties.

On-site soil sampling will be limited to the area around the former surface impoundment. Four off-site areas have been identified for soil sampling:

1. The drainage ditch that runs south parallel to and west of Normandie Avenue from the site to the catchment basin at Farmer Bros.;

2. The SPRR right-of-way, east of the railroad tracks and west of Normandie Avenue;

3. The LADWP right-of-way in the general vicinity of the two power substations bordering Jones Chemical Company;

4. A historical drainage where air photos indicate that the drainage crossed the north portion of Farmer Bros.

ON-SITE SOIL ASSESSMENT

Analytical results from soil samples collected from previously drilled soil borings S-101, S-201 through S-204, 13D, 14D, 23D, 24D, 25A, and monitor well MW-2 provide data regarding soil conditions between land surface and approximately 60 feet bls in the vicinity of the former surface impoundment. Approximately 300 lineal feet of additional soil borings are proposed in the vicinity of the former impoundment (Figure 10). Approximately 30 samples will be collected from an array of five 60-foot deep soil borings. The soil sampling is intended to provide information on the horizontal and vertical distribution of Target Chemicals in the soil in the vicinity of the former impoundment.

The locations for soil borings S-301, S-302, and S-304 were proposed by the EPA at a June 4, 1987, technical meeting. The proposed locations for soil borings S-303 and S-305 have been slightly modified. Soil boring S-305 is a 60-foot soil boring proposed near the location of previous soil boring 14D (Figure 10). Analytical results from soil samples collected from boring 14D by Metcalf & Eddy, Inc. indicated chlorobenzene and total DDT concentrations of approximately 1000 mg/kg between 6 and 13 feet bls (Metcalf & Eddy, Inc, 1986). The proposed location for soil boring S-303 has been adjusted to define the potential extent of Target Chemicals in deep soils southwest of the former impoundment.

Soil samples will be collected at 10-foot intervals between 10 feet bls and 60 feet bls using split-tube samplers fitted with brass liners. Soil samples will be analyzed for all Target Chemicals.

Additional soil samples, representative of the various soil types encountered, will be collected and analyzed for pH, percent moisture, EC, and total organic carbon. These data will be used to evaluate the suitability of the soil for possible treatment methods. Eight soil samples from four distinct lithologic intervals in two soil borings will be submitted for these additional analyses (Table 3). The soil sample intervals may be altered in the field depending on the actual soil type encountered.

OFF-SITE SOIL ASSESSMENT

Soil samples will be collected to further define the horizontal and vertical distribution of Target Chemicals along the Normandie Avenue ditch and to further define the horizontal and vertical distribution of nonvolatile Target Chemicals at the remaining off-site soil assessment areas. Soil samples will be collected along transects 3 through 6 near the Normandie Avenue ditch, from two locations east and one location west of the SPRR tracks, from five locations in the LADWP right-of-way, and from the north side of the Farmer Bros. facility along transect 2 crossing the historical drainage area **(Figure 10)**.

Six additional off-site soil samples representative of the various soil types encountered will be collected and analyzed for pH, percent moisture, EC,and total organic carbon **(Table 3)**.

Soil sample collection and field measurement methods are outlined on **Page 43, Soil and Sediment Sampling Procedures, Page 46, Field Measurements and Equipment Requirements**, and are detailed in Section 5.3.2, Page 17 of the QAPP.

Normandie Avenue Ditch

Phase I work in the drainage ditch that parallels the west side of Normandie Avenue between the Montrose site and Farmer Bros. consisted of collecting soil samples from sixteen 5-foot deep soil borings drilled along transects 3 through 6. The transects are located perpendicular to the flow direction in the ditch. Six additional soil borings are proposed in this area **(Table 3; Figure 10)**.

Borings T33, T42, and T64, drilled during the Phase 1 off-site activity, will be extended from 5 to 21 feet bls. These borings are located along transects 3, 4, and 6 respectively **(Table 3; Figure 10)**. Five soil samples will be collected at 3-foot intervals from each 21-foot deep boring beginning at approximately 9 feet bls.

Two 60-foot soil borings will be drilled, one along transect 4 and another along transect 5. Boring T46 will be drilled to 60 feet bls. Boring T52 will be extended from 5 feet to 60 feet bls. Eleven soil samples will be collected at 5-foot intervals between 10 and 60 feet bls at both 60-foot borings. Seven soil samples will be collected from each 60-foot boring at 10, 15, 20, 30, 40, 50 and 60 feet bls and will be submitted for analysis. The remaining samples will be extracted for possible analysis pending the results from the samples analyzed.

The additional 5-foot boring T34 will be located on the west end of transect 3. Soil samples will be collected at 1-foot intervals between 1 and 5 feet bls.

Soil samples from off-site locations will be analyzed for total DDT and total BHC by Method 8080. Soil from each split spoon sampler will be screened for the presence of VOC's by means of field OVA head space tests. VOC analysis by Method 8240 will be requested if the field test indicates the presence of VOC's in the soil sample. Field test procedures are detailed on **Page 46, Field Measurements and Equipment Requirements** and in Section 6.3, Page 36 of the QAPP.

To evaluate the relationship between particle size and DDT concentrations, two shallow soil samples will be collected from T52 between 0.0 and 0.5 feet bls and between 1.5 and 2.0 feet bls **(Table 3; Figure 10)**. Sample locations and depths were determined from Part 2, Phase 1 data which indicate a lithologic change at 1.25 feet bls and total DDT concentrations greater than 100 milligrams per kilogram (mg/kg) between the land surface and 2.0 feet bls (Hargis + Associates, Inc., 1986c and 1987b). Particle size sieve analyses will be performed in the field according to the procedures described in Section 5.4.4, Page 26 in the QAPP. The resulting particle size fractions will be analyzed for total DDT and BHC using EPA Method 8080.

Southern Pacific Railroad Right-of-Way

Phase 1 off-site activity included 5-foot deep borings SP1 and SP2 located directly east of the Montrose site in the SPRR right-of-way. Additional 5-foot soil boring SP3 is proposed along the SPRR right-of-way south of boring SP2. Five-foot soil borings SP4 and SP5, located east of the SPRR right-of-way and west of Normandie Avenue, respectively, are proposed at the request of the EPA. These two borings will provide data regarding the presence of pesticide residues in soil between the SPRR right-of-way and Normandie Avenue. Soil samples will be collected from each of the 5-foot borings at 1-foot intervals between approximately 1 and 5 feet bls.

Farmer Brothers Property

A transect consisting of seven 8-foot deep borings is proposed across a historical drainage located on Farmer Bros. property south of the LADWP right-of-way (**Table 3; Figure 10**). The location of the historical drainage was approximated from 1941 aerial photographs. The reference points used to transfer the historical drainage location from the 1941 air photo to **Figure 10** of the Phase 2A Sampling Plan were the intersection of Normandie Avenue and 204th Street, the southeast and northeast corner of the Montrose site, and the southwest corner of the Jones Chemical Company parcel. The historical drainage was oriented approximately north to south in the area of the proposed transect. The historical drainage will be located in the field by measuring the specified distance from the transmission power pole adjacent to the Farmer Bros. building. Approximately 4 feet of fill is present at Farmer Bros. in the area of the historical drainage. Five soil samples will be collected at 2-foot intervals between land surface and 8 feet bls.

Los Angeles Department of Water and Power Right-of-Way

Three shallow borings are proposed along the southern boundary of the LADWP right-of-way **(Table 3; Figure 10)**. These 3-foot borings will be located immediately south of the LADWP substation in a topographically low area which coincides with the approximate location of the historical drainage. Two additional 3-foot borings are proposed west of the substation. Three soil samples will be collected from each of the five shallow borings between land surface and 3 feet bls.

SEDIMENT SURVEY AND SAMPLING PROGRAM

During Phase 1 off-site sediment sampling, sediment samples were collected from five locations in Dominguez Channel between the Main Street bridge and the Sepulveda Boulevard bridge. Phase 2A off-site sediment activity will focus on gathering additional data to aid in determining the approximate volume of sediment in the Dominguez Channel in the vicinity of the Torrance Lateral discharge **(Figure 11)**. Additional sediment sampling for pesticide analysis will also be performed in this vicinity. In addition, background sediment samples will be collected approximately 2.5 miles upstream from the Torrance Lateral discharge.

Three types of sampling equipment will be available to conduct the sediment thickness survey and collect the sediment samples. The method used will depend on the field conditions encountered. The three methods are an acoustic coring technique performed from a floating pontoon barge, a manually driven coring technique, and a hand augering technique. The three sediment sampling field methods are further discussed in the following section and in Section 5.3.3, Page 20 and Section 6.5, Page 38 of the QAPP. Additional health and safety concerns introduced by working over water are addressed in the HSP.

Sediment Field Methods

The preferred technique to measure sediment thickness involves the use of a floating pontoon platform equipped with a Vibra Corer^{TM} portable sampling drill designed specifically for use in unconsolidated sediments. The Vibra Corer^{TM} uses an acoustic drilling technique to collect continuous, undisturbed sediment core. The floating pontoon platform will be stabilized over each sampling location using one of three procedures. The first procedure will deploy an anchor from each corner of the platform. Special effort will be made to set the anchors off the transect line, away from the sampling points. Damage to the channel from the light-weight anchors is not expected. The second procedure will consist of tethering the platform with taut lines secured to stable stationary objects on either side of the channel embankment. The third procedure will utilize the stabilizing effect of the drill string while coring, coupled with manipulation of the motor propelling the platform. The third method would be viable only at times of minimal current flow and tidal influx. When the samples for the sediment thickness survey are collected, clear plastic tubing will be inserted inside the drill stem. Sediment thickness will be measured directly from the core samples. The continuous core method also permits discrete samples to be collected for laboratory analysis by lining the drill stem with thin-walled brass or stainless steel tubing. Variations in penetration rate indicate changes in material density and will be used to determine when the channel lining is encountered. The channel lining will not be penetrated to such an extent that the integrity of the lining will be impaired.

If sediment conditions do not allow adequate sample recovery using the Vibra Corer^{TM} method, a light-weight, thin-walled suction-tube sampler will be used. The sampler will be equipped with an internal plunger to aid in sample retention. Sediment thickness will be estimated by measuring the sediment obtained in the acrylic tube. Discrete sediment samples for laboratory analyses will be collected by extruding the core from the tube with the internal plunger and collecting the discrete samples in laboratory-cleaned, 1/2-liter wide-mouth glass jars. This sediment sampling method has been used frequently to collect environmental samples in the San Francisco Bay area on projects which are regulated by the RWQCB and the DOHS.

The third field method proposed is hand augering. Sediment thickness will be determined by measuring the depth to which the auger is advanced prior to encountering the channel lining material. Collecting sediment samples for laboratory analyses may not be feasible at depths greater than 1.5 feet using the hand auger method. The advantage of this method is that sediment is not likely to be lost during sampling.

Sediment Survey

The distribution of sediment deposits in the Dominguez Channel near the Torrance Lateral discharge will be estimated by measuring the sediment thickness along a series of transects perpendicular to the channel thalweg **(Figure 11)**. Twenty transects are proposed between the southern boundary of the Victoria Park Golf Course and Carson Street. Detailed channel construction drawings will be obtained from the LACFCD and will be used to supplement the survey. Sediment thickness will be measured at the center of the channel and at two locations between the center and the borders of the channel for a total of three thickness measurements per transect. Transect locations will be determined and marked relative to channel station markers, bridges, roadways, and other identifiable landmarks. These locations will be recorded in the field notebook and marked with flagged stakes or spray paint along the channel embankment so that they can be identified from the sampling vessel. Sediment thickness distribution along and between each transect will be inferred from the sediment thickness measurements, as constrained by the channel configuration observed in the field and in construction drawings. Based on inferred sediment thickness distribution, an estimate of the volume of sediment in the channel can be made.

One sediment sample for particle size analysis will be collected from the area near the confluence of the Torrance lateral and Dominguez Channel. A particle size analysis will be performed on this sample to determine the size distribution of sediment in the vicinity of the confluence. The analysis will be performed according to the standard method for particle size analysis of soils outlined by the American Society for Testing and Materials (ASTM, 1986).

Sediment Sampling

The sediment in Dominguez Channel will be sampled and analyzed for total DDT, total BHC, and percent organic carbon to provide data to support the Feasibility Study. Six discrete sample locations and two composite sample locations will be selected based on the sediment analytical results from Phase 1 and the distribution of sediment thickness determined during the Phase 2A sediment survey. Sample locations and depths will be selected which are representative of the vertical and lateral distribution of sediment in the vicinity of the confluence of Torrance lateral and Dominguez Channel.

Discrete sediment sample locations will generally be selected in areas where the sediment is most abundant as determined by the sediment survey. One sediment sample location will be selected upstream of the confluence of the Torrance lateral and Dominguez Channel, near the northernmost limits of the sediment survey. One additional sediment sample location will be selected near the southernmost limits of the sediment survey, downstream from the confluence. Four additional sediment sample locations will be spatially distributed throughout the sediment deposit in such a way that the distribution of DDT and BHC concentrations can be estimated.

Discrete sediment samples will be collected at 1-foot depth intervals between the surface of the sediment and the channel lining. The actual number of discrete samples collected at each sampling location will vary according to the thickness of sediment at that sampling location. Each discrete sediment sample will be analyzed for total DDT and total BHC.

Two additional sediment sampling locations will be selected for composite analyses. Composite sample locations will be selected from areas where sediment thickness is greatest. Samples submitted from each of these additional locations will be composited from the entire cored interval. Composite samples will be prepared by extruding the entire cored sediment column from each location into a large decontaminated metal container. This sediment will be thoroughly mixed using a decontaminated metal utensil. The composited sample will be transferred to two laboratory-cleaned 1/2-liter wide-mouth glass jars with teflon-lined threaded caps. These additional samples will be analyzed for total DDT, total BHC and percent organic carbon.

A background sediment sample location has been selected in the Dominguez Channel near Vermont Avenue, approximately 2.5 miles upstream from the Torrance Lateral discharge **(Figure 11)**. Ten feet of sediment were measured at that location during a May 1987 reconnaissance of the Dominguez Channel. Discrete background sediment samples will be collected at 2-foot intervals between the surface of the sediment and the channel lining. It is estimated that a total of six discrete background sediment samples will be collected at the Vermont Avenue location.

SOIL AND SEDIMENT SAMPLING PROCEDURES

On-site and off-site soil and sediment sampling procedures have been summarized **(Tables 1, 3, and 4)**. They are further detailed in Section 5.3.2, Page 17 and Section 5.3.3, Page 20 in the QAPP. The following is a summary of the soil and sediment sample collection procedures and the associated field measurements and equipment requirements for this part of the proposed Phase 2A activity.

Soil Sample Collection

A modified California split-tube drive sampler will be used in conjunction with a small-diameter hollow stem auger to collect soil samples from the proposed 21-foot deep and 60-foot deep soil borings. The sampler will be lined with three 6-inch by 2-inch brass tubes. The 5-foot deep borings may be sampled using a small diameter hollow stem auger and a split-tube continuous core barrel instead of the modified California drive sampler. If the core barrel is used it will be lined with decontaminated brass tubes. For the 5-foot deep borings, all soil samples can be efficiently collected at even 1-foot intervals by advancing a single 5-foot auger flight. A hand auger may be used to advance the 3-foot deep soil borings. A single tube soil sampler driven by a manually operated slide hammer will be used to collect the soil sample. In areas where underground utilities are prevalent the hand auger provides a means to collect a soil sample with minimal risk of pipeline damage. Auger borings completed above the water table will be backfilled with a neat cement or a sand-cement slurry. Boreholes completed below the water table will be abandoned with neat cement or a sand-cement slurry to be tremied from the bottom of the boring to land surface. The neat cement or sand-cement slurry will be mixed using 5 to 6 gallons of water per sack of cement. A minimum of seven sacks of cement per cubic yard will be used for sand-cement slurry mixtures.

The upper and lower ends of the brass tubes will be marked and, when requested, an adjacent sample will be provided as a split sample to the EPA. Because true duplicates of soil samples cannot be obtained without compromising sample integrity, adjacent sample tubes will be used as soil duplicate and EPA split samples. In order to minimize the separation between soil duplicate and EPA samples, adjacent sample tubes will be marked with arrows indicating the end to be subsampled in the laboratory. Following the same format, Montrose will collect one duplicate soil sample per day or 10 percent per day, whichever is greater.

Samples collected in brass sleeves will be immediately sealed in the tubes with teflon liners and plastic end caps. End caps will be secured with electrical tape. Each sample container will be labeled immediately and stored on ice. Samples will be shipped or delivered to the laboratory within 24 hours. All sampling devices which are to be reused will be decontaminated prior to each use. Decontamination procedures for all soil sampling devices are detailed in Section 5.3.2, Page 19 in the QAPP. A sampling equipment rinsate sample will be collected for Target Chemical analysis for on-site soil samples, and for nonvolatile Target Chemical analysis for off-site soil samples, at a rate of one per day during sampling equipment decontamination.

Sediment Sample Collection

Sediment samples from Dominguez Channel will be collected by one of three field methods proposed on Page 39, Sediment Field Methods. Sample collection procedures are dependent upon the method used.

If samples are collected with the Vibra Corer™, the sediment will be contained in decontaminated brass or stainless steel tubes. Because vibrations must be transmitted down the drill stem, 5-foot lengths of uncut tubing may be required to obtain complete sample recovery. A hand pipe cutter and tripod will be on board the barge to provide rapid tube cutting capability, if needed. Sample tubes will be immediately sealed with teflon liners and plastic end caps or two layers of heavy-duty aluminum foil. Plastic or aluminum end caps will be sealed with electrical tape. Duplicate sediment samples and EPA split sediment samples, when required, will be obtained by packaging sediment core that is immediately above or below the primary sample.

If samples are collected with the suction tube sampler, sediment will be extruded in 6-inch intervals and collected in laboratory-cleaned 1/2-liter wide-mouth glass jars with teflon-lined threaded caps. Duplicate and EPA split samples will be obtained by extruding sediment alternately into different wide-mouth jars.

Sample containers will be sealed immediately and secured with electrical tape. Each sample container will be labeled immediately and stored on ice in individual plastic bags. Samples will be shipped or delivered to the laboratory within 24 hours.

Decontamination procedures for all sediment sample collection equipment are detailed in Section 5.3.2, Page 19 in the QAPP. Equipment rinsate samples will be collected for pesticide analysis at a rate of one sample per day during sample equipment decontamination.

If samples are collected with the hand auger, sediment will be transferred from the auger to 1/2-liter wide-mouth glass jars with clean dedicated utensils. Duplicate and EPA split samples will be obtained by alternating scoops from the hand auger to the wide-mouth jars.

Because of the potential complexity of obtaining sediment samples at depth it is possible that only two or three samples per day may be collected. Duplicate sediment samples will not be collected on a one per day minimum basis because daily production of samples may be very low. Duplicate sediment samples are not true duplicates and therefore are of limited use. Duplicate samples will be submitted to the lab at an overall rate of 10 percent of the total number of sediment samples.

Quality Assurance Samples

Preliminary locations for on-site and off-site field duplicate soil samples will be determined prior to commencing field work each day. Specific sample locations may be subject to change based on the extent of sampling activity conducted each day. Field duplicate soil samples will be collected and submitted at a minimum rate of one per day or 10 percent of the total number of samples collected each day. The specific sampling locations for field duplicate soil samples will be selected to provide a representative distribution of the study area. Field duplicate soil samples collected from the Normandie Avenue ditch will also be selected on the basis of field OVA measurements.

Locations for field duplicate sediment samples will be determined prior to commencing field work each day. Specific sample locations will be subject to change based on the extent of sampling activity conducted each day. Field duplicate sediment samples will be collected at a rate of 10 percent of the total number of samples collected. The specific sampling locations for field duplicate sediment samples will be selected to provide a representative distribution of the area sampled.

Field Measurements and Equipment Requirements

Field measurements for the off-site soil and sediment sampling activities will include descriptions of soils, general descriptions of weather conditions, and any other observations concerning field conditions which might affect the sample collected. Lithologic logs of each boring will be made in accordance with procedures outlined in Section 6.1, Page 33 in the QAPP. When possible, these logs will include descriptions of the sediments encountered, grain size, shape, sorting, color mineral composition, moisture content, and degree of induration. All logging will be supervised by an experienced geologist. Soil samples collected from the Normandie Avenue ditch will be screened using an OVA in accordance with the procedures outlined in Section 6.3, Page 36 in the QAPP. Field OVA readings from soil samples were compared to analytical results from adjacent soil samples collected during Part 2, Phase 1 RIW activity. These data indicated that the screening procedure was generally a good predictor of the presence of VOC's. If organic vapor is detected in soil samples, analysis by EPA Method 8240 will be specified. All field measurements will be recorded in a field notebook. Sampling procedures will also be noted and will include method, type of container used, depth and location of sample, and short-term storage procedures.

All nondedicated equipment used to collect samples to be submitted for chemical analysis will be decontaminated before and between uses as described in Section 5.3.2, Page 19 in the QAPP. Drill rig flight augers will be steam cleaned before each use. Appropriate labels and chain-of-custody forms will be used during sample collection, transmittal and analysis. Examples of the labels and chain-of-custody forms to be used may be found in Appendix A of the QAPP.

PROJECTED WORK SCHEDULE

The projected Phase 2A groundwater, soil and sediment sampling schedule consists of three general field activity periods **(Figure 12)**. The first period will consist of the sediment thickness survey and sediment sampling in Dominguez Channel. The second period will consist of off-site and on-site soil sampling. The third field activity period will encompass exploratory boring and monitor well installation, including groundwater sampling.

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Tables

TABLE 1

SUMMARY OF ANALYTICAL PROCEDURES

TARGET CHEMICALS

ANALYTES	EPA METHOD[(1)] WATER	EPA METHOD[(1)] SOIL	EPA METHOD SOIL PREPARATION[(1)]	DETECTION LIMIT[(2)] WATER (ug/l)	DETECTION LIMIT[(2)] SOIL (mg/kg)
DDT, DDD, DDE	608	8080	3550	0.2	0.002
BHC (alpha, beta, delta and gamma)	608	8080	3550	0.08	0.001
Chlorobenzene	624	8240	5030	1	0.13
1,2-Dichlorobenzene	624	8240	5030	1	0.13
1,4-Dichlorobenzene	624	8240	5030	1	0.13
Chloroform	624	8240	5030	1	0.13
Benzene	624	8240	5030	2	0.25
Acetone	624	8240	5030	20	2.5

COMMON IONS

ANALYTES	EPA METHOD WATER	DETECTION LIMIT[(2)] WATER (mg/l)
Calcium	215.1	0.1
Magnesium	242.1	0.1
Sodium	273.1	0.1
Potassium	258.1	0.05
Alkalinity	310.1	10
Chloride	325.2	1
Sulfate	375.3 or 375.4	1
Nitrate	353.2	0.4
Fluoride	340.2	0.1
Boron	200.7 or 212.3	0.05
Silica	APHA 303 C[(3)]	1
Total Dissolved Solids	160.1	5

(1) EPA, 1986
(2) Laboratory Method Detection Limit (MDL)
(3) American Public Health Association, 1985
ug/l = micrograms per liter
mg/kg = milligrams per liter
mg/l = milligrams per kilogram

TABLE 2

REGIONAL WATER TABLE ELEVATIONS

WELL NO.	DATE MEASURED	WATER LEVEL ELEVATION (Feet msl)	REFERENCE
WCC-1	11-6-87	-21.81	Woodward-Clyde Consultants, Inc. 1987b
MW-3	2-25-87	-24.69	Hargis + Associates, Inc., 1987h
DP-2	3-10-87	-25.93	Woodward-Clyde Consultants, Inc. 1987a
DG-2	3-10-87	-27.13	Woodward-Clyde Consultants, Inc. 1987a
B-17	2-27-87	-27.62	BCL Associates, Inc. 1987
B-122	7-13-87	-24.36	R.L. Stollar and Associates, 1987

Feet msl = Feet, mean sea level

TABLE 3

PROPOSED SAMPLING PROGRAM

SAMPLING LOCATION/ SAMPLE TYPE	SAMPLE IDENTIFICATION	NUMBER OF BORINGS OR WELLS	SAMPLING METHOD	DEPTH OF BORING OR WELL (Ft)	SAMPLE DEPTHS (Ft)	NUMBER OF SAMPLES PER BORING OR WELL	TYPE OF ANALYSES
Phase 1 Monitor Wells/ Groundwater	MW-1 thru MW-5	5	Bladder Pump	75	NA(1)	1 per round	Method 608 & 624
	BF-1 thru BF-4	4	Bladder Pump	125	NA	1 per round	Method 608 & 624
	G-1 thru G-3	3	Bladder Pump	165	NA	1 per round	Method 608 & 624
	LG-1	1	Bladder Pump	205	NA	1 per round	Method 608 & 624
Phase 2A Monitor Wells/ Groundwater	MW-6 thru MW-15	10	Bladder Pump	85	NA	1 per round	Method 608, 624 & Common Ions
	BF-5 thru BF-8	4	Bladder Pump	125	NA	1 per round	Method 608, 624 & Common Ions
	G-4 thru G-7	4	Bladder Pump	180	NA	1 per round	Method 608, 624 & Common Ions
	LG-2	1	Bladder Pump	215	NA	1 per round	Method 608, 624 & Common Ions
On-Site/Soils	S301 thru S305	5	Drive Sample	60	10,20,30,40, 50,60	6	Method 8080 and 8240
	S302, S305	2	Drive Sample	60	5,20,30,50	4	TOC, pH, EC, % Moisture(2)
Normandie Avenue Ditch/Soils Transect 3	T33	1	Drive Sample	21	9,12,15,18,21	5	Method 8080(3)
	T34	1	Continuous Core	5	1,2,3,4,5	5	Method 8080(3)
Transect 4	T42	1	Drive Sample	21	9,12,15,18,21	5	Method 8080(3)
	T46	1	Drive Sample	60	10,15,20,25, 30,35,40,45, 50,55,60	11	Method 8080(3)
Transect 5	T52	1	Drive Sample	60	0,2	2	Sieve(4) and Method 8080
	T52	1	Drive Sample	60	10,15,20,25, 30,35,40,45, 50,55,60	11	Method 8080(3)
Transect 6	T64	1	Drive Sample	21	0,1	2	TOC, pH, EC, % Moisture
	T64	1	Drive Sample	21	9,12,15,18,21	5	Method 8080(3)

Ft = Feet.
(1) NA = Not applicable.
(2) TOC, pH, EC, % Moisture = Total Organic Carbon, pH, Electrical Conductivity, and Percent Moisture.
(3) Plus EPA Method 8240 if OVA screening indicates the presence of volatile compounds.
(4) Sieve analysis to be performed on soil samples from 0.0 to 0.5 and 1.5 to 2.0 feet bls. Grain size fractions to be analyzed by EPA Method 8080.
(5) Sieve analysis to be performed on one sediment sample collected in Dominguez Channel near the confluence of the Torrance Lateral. No chemical analysis.

HARGIS + ASSOCIATES, INC.

BOE-C6-0185489

TABLE 3 (continued)
PROPOSED SAMPLING PROGRAM

SAMPLING LOCATION/ SAMPLE TYPE	SAMPLE IDENTIFICATION	NUMBER OF BORINGS OR WELLS	SAMPLING METHOD	DEPTH OF BORING OR WELL (Ft)	SAMPLE DEPTHS (Ft)	NUMBER OF SAMPLES PER BORING OR WELL	TYPE OF ANALYSES
Southern Pacific Railroad Right-of-Way/Soils							
SE corner of site	SP3	1	Continuous Core	5	0,5	2	TOC, pH, EC, % Moisture
					1,2,3,4,5	5	Method 8080
East of railroad	SP4, SP5	2	Continuous Core	5	1,2,3,4,5	5	Method 8080
Los Angeles Department of Water and Power Right-of-Way/Soils	LA15 thru LA19	5	Hand Auger	3	0,1.5,3	3	Method 8080
	LA16	1	Hand Auger	3	0,3	2	TOC, pH, EC, % Moisture
Farmer Brothers Property/Soils Transect 2	T21 thru T27	7	Drive Sample	8	0,2,4,6,8	5	Method 8080
Dominguez Channel/ Sediment Samples	SED101 thru SED106	6	Core/Hand Auger	Location, number, and depth of samples will be determined based on results from sediment thickness survey. Discrete samples will be obtained at 1-foot intervals.			Sieve(5), Method 8080, and Percent Organic Carbon
	SED 107, SED 108	2	Core	Samples will be composited from entire cored interval.			Method 8080 and TOC
Background Sediment Sample	BGS1	1	Core/Hand Auger	10	0,2,4,6,8,10	6	Method 8080

Ft = Feet.
(1) NA = Not applicable.
(2) TOC, pH, EC, % Moisture = Total Organic Carbon, pH, Electrical Conductivity, and Percent Moisture.
(3) Plus EPA Method 8240 if OVA screening indicates the presence of volatile compounds.
(4) Sieve analysis to be performed on soil samples from 0.0 to 0.5 and 1.5 to 2.0 feet bls. Grain size fractions to be analyzed by EPA Method 8080.
(5) Sieve analysis to be performed on one sediment sample collected in Dominguez Channel near the confluence of the Torrance Lateral. No chemical analysis.

TABLE 4

SAMPLE HANDLING PROTOCOL

TYPE OF ANALYSIS	NUMBER, TYPE, AND SIZE OF CONTAINER	SAMPLE VOLUME	PRESERVATION	PRE-EXTRACTION HOLDING TIME	POST-EXTRACTION HOLDING TIME	CONTAINER CLEANING
WATER SAMPLES						
Purgeable (Volatile) Organics (EPA Method 624)	Two 40-ml glass vials, teflon-backed septum	Vials filled completely, no air space	Wrap in plastic bag, cool to 4°C in ice chest	14 days	NA*	Bottles and septa washed with detergent, rinsed with distilled water, and dried one hour at 105°C.
Pesticides (EPA Method 608)	Two 1-liter amber glass bottles with teflon-lined caps	Bottles filled 5/6 full	Wrap in plastic bag, cool to 4°C in ice chest	7 days	40 days	Bottles and cap liners rinsed with methylene chloride and dried by vacuum or other safe means until no solvent remains.
Common Ions	One 1-liter poly-ethylene bottle	Bottle filled completely	Wrap in plastic bag, cool to 4°C in ice chest	14 days	NA*	Container washed with detergent and rinsed with distilled water.
Nitrate	One 100-ml poly-ethylene bottle	Bottle filled completely	Preserve sample with sulfuric acid to pH of less than 2; wrap in plastic bag, cool to 4°C in ice chest	28 days	NA*	Container washed with detergent and rinsed with distilled water, pretreated with sulfuric acid.

* NA = Not applicable

TABLE 4 (continued)
SAMPLE HANDLING PROTOCOL

TYPE OF ANALYSIS	NUMBER, TYPE, AND SIZE OF CONTAINER	SAMPLE VOLUME	PRESERVATION	PRE-EXTRACTION HOLDING TIME	POST-EXTRACTION HOLDING TIME	CONTAINER CLEANING
SOIL SAMPLES						
Volatile Organics (EPA Method 8240)	One sealed brass tube sleeve with teflon-lined film and plastic cap	6" x 2" tube. 2 gram aliquot required	Wrap in plastic bag, cool to 4°C in ice chest	**	**	Sampler washed with detergent; rinsed with tap water, methanol, distilled water.
Pesticides (EPA Method 8080)	One sealed brass tube sleeve with teflon-lined film and plastic cap	6" x 2" tube. 10 gram aliquot required	Wrap in plastic bag, cool to 4°C in ice chest	7 days	30 days	Sampler washed with detergent; rinsed with tap water, methanol, distilled water.
EC, pH, Percent Moisture, & Total Organic Carbon	One sealed brass tube sleeve with teflon-lined film and plastic cap	6" x 2" tube.	Wrap in plastic bag, cool to 4°C in ice chest	***	***	Sampler washed with detergent; rinsed with tap water, methanol, distilled water.
SEDIMENT SAMPLES						
Pesticides (EPA Method 8080)	One sealed brass tube sleeve with teflon-lined film and plastic cap	6" x 2" tube. 10-gram aliquot required	Wrap in plastic bag, cool to 4°C in ice chest	7 days	30 days	Sampler washed with detergent; rinsed with tap water, methanol, distilled water.
	or: Two 1/2-liter wide-mouth glass jars, teflon-lined threaded caps	Jars filled completely 10-gram aliquot required	Wrap in plastic bag, cool to 4°C in ice chest			Jars and cap liners rinsed with methylene chloride and dried by vacuum or other safe means until no solvent remains.
Total Organic Carbon	One sealed brass tube sleeve with teflon-lined film and plastic cap	6" x 2" tube.	Wrap in plastic bag, cool to 4°C in ice chest	***	***	Sampler washed with detergent; rinsed with tap water, methanol, distilled water.
	or: Two 1/2-liter wide-mouth glass jars, teflon-lined threaded caps	Jars filled completely	Wrap in plastic bag, cool to 4°C in ice chest			Jars and cap liners rinsed with methylene chloride and dried by vacuum or other safe means until no solvent remains.

** Extraction and analysis will be conducted within 14 days of sample collection.
*** Extraction holding time not established at this writing.

TABLE 5

SUMMARY OF QUALITY CONTROL FIELD SAMPLES

SAMPLE TYPE	SAMPLE DESCRIPTION			COLLECTION FREQUENCY	TYPE OF ANALYSIS
GROUNDWATER	FIELD DUPLICATE AND LABORATORY CHECK	ACTUAL SAMPLE LOCATION	FIELD DUPLICATE SAMPLE ID		
	ROUND 1	MW-6	MW-600	Field duplicate samples collected at a rate of 10 percent of monitor wells sampled or one per day minimum.	Method 608 and 624
		MW-11	MW-1100		
		BF-6	BF-600		
		G-7	G-700		
	ROUND 2	MW-9	MW-900		
		MW-14	MW-140		
		BF-8	BF-800		
		G-5	G-500		
	FIELD BLANK	SAMPLE PREPARATION LOCATION	SAMPLE ID		
	ROUND 1	MW-6 WELLHEAD	WB-1	One per day	Method 608 and 624
		MW-11 WELLHEAD	WB-1		
		BF-6 WELLHEAD	WB-1		
		G-7 WELLHEAD	WB-1		
	ROUND 2	MW-9 WELLHEAD	WB-1		
		MW-14 WELLHEAD	WB-1		
		BF-8 WELLHEAD	WB-1		
		G-5 WELLHEAD	WB-1		
	TRIP BLANK PREPARED BY BROWN & CALDWELL	SAMPLE ANALYZED BY			
	ROUND 1	BROWN & CALDWELL LAB.	TB-1	One sample per shipping container*	Method 624
		ATI	TB-2	One sample per shipping container*	Method 624
	ROUND 2	BROWN & CALDWELL LAB.	TB-1	One sample per shipping container*	Method 624
		ATI	TB-2	One sample per shipping container*	Method 624

* If more than one groundwater sample per shipping container.
ATI = Analytical Technologies, Inc.

TABLE 5 (continued)
SUMMARY OF QUALITY CONTROL FIELD SAMPLES

SAMPLE TYPE	SAMPLE DESCRIPTION	COLLECTION FREQUENCY	TYPE OF ANALYSIS
SOIL/ON-SITE	Theoretical field duplicate, sample tube adjacent to primary soil sample	10 percent or one sample per day, minimum	Method 8080 and 8240
	Equipment rinsate	One sample per day collected from one soil sampler	Method 608 and 624
SOIL/OFF-SITE	Theoretical field duplicate, sample tube adjacent to primary soil sample	10 percent or one sample per day, minimum	Method 8080[1]
	Equipment rinsate	One sample per day collected from one soil sampler	Method 608[1]
	Normandie Avenue Ditch particle size rinse water	One sample composited per soil sample	Method 608
	Normandie Avenue Ditch sieve analysis equipment rinsate	One sample composited per soil sample	Method 608
SEDIMENT	Theoretical field duplicate	One sample collected for every ten consecutive samples	Method 8080 and total organic carbon
	Equipment rinsate	One sample per day collected from one sediment sampler	Method 608

Notes:
1) In Normandie Avenue Ditch samples, EPA Method 8240 or 624 will be used if VOC screening results indicate the presence of volatile compounds.

Illustrations

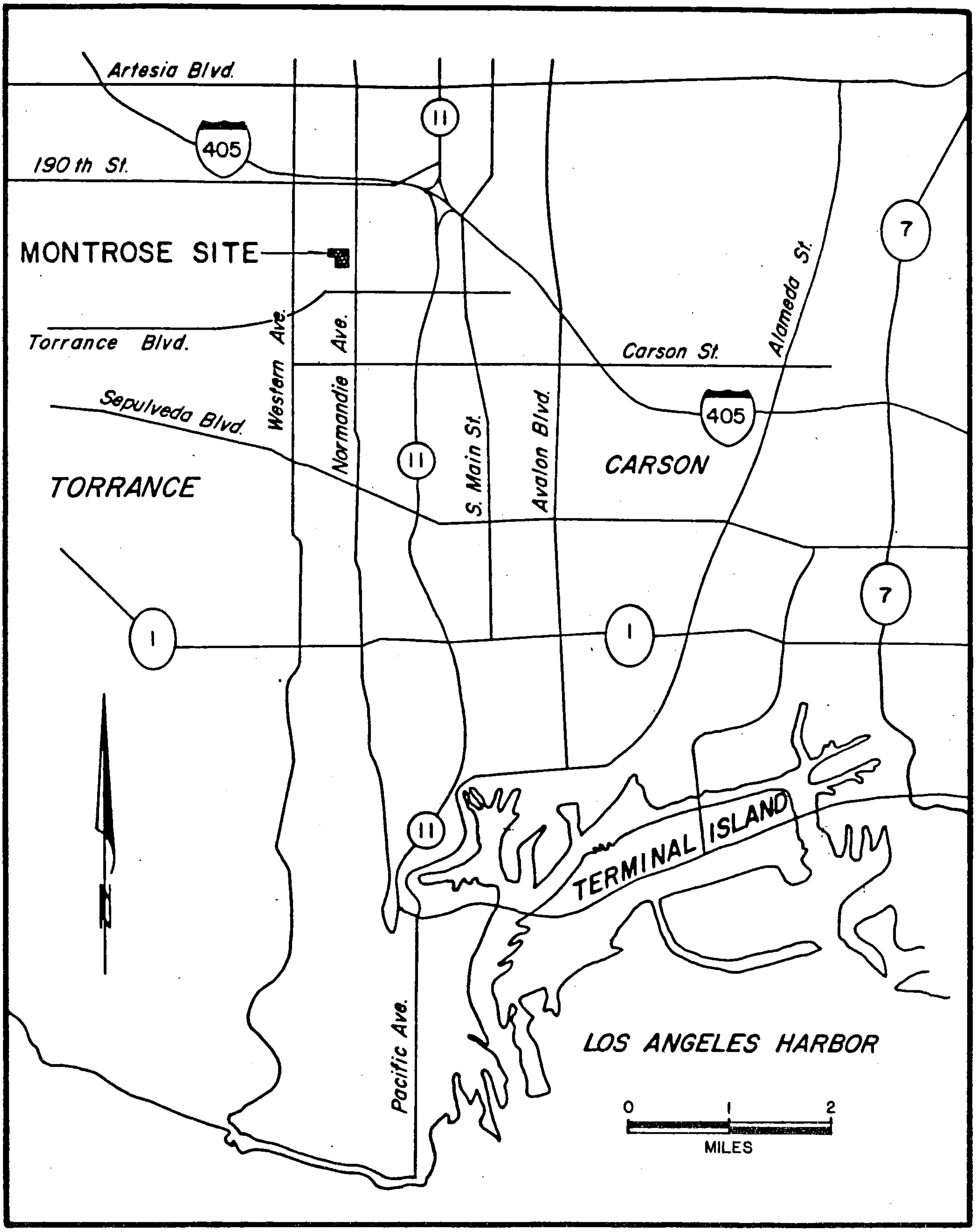
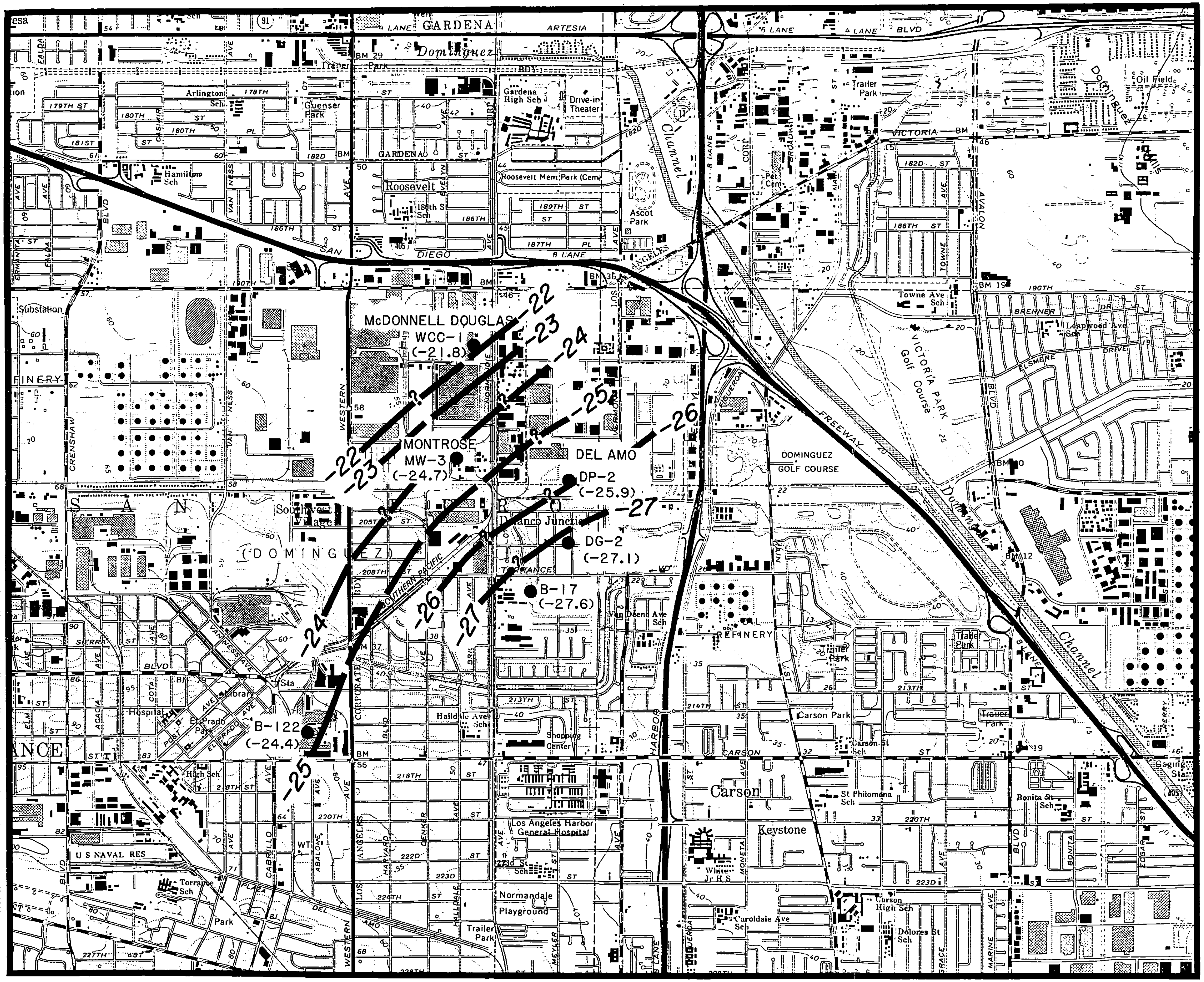


FIGURE I. LOCATION OF MONTROSE SITE

HARGIS + ASSOCIATES, INC.



EXPLANATION

MW-3
● MONITOR WELL LOCATION
(-24.7) WATER LEVEL ELEVATION IN FEET, MEAN SEA LEVEL

—— -24 —— — —?

CONTOUR OF EQUAL WATER LEVEL ELEVATION IN REGIONAL MONITOR WELLS
DASHED WHERE APPROXIMATE, QUERIED WHERE INFERRED
GROUNDWATER LEVELS MEASURED FEBRUARY–NOVEMBER 1987

NOTE:

WATER TABLE ELEVATIONS WERE MEASURED OVER A 9-MONTH PERIOD. THESE DATA ARE THE CLOSEST MEASUREMENTS IN TIME AVAILABLE FOR THE AREA DEPICTED. THE CONTOUR LINES SHOWN ARE INFERRED BASED ON THE ASSUMPTION THAT WATER LEVEL CHANGES DURING THIS TIME PERIOD ARE MINIMAL.

0 2,000 4,000
FEET

MONTROSE SITE
TORRANCE, CALIFORNIA

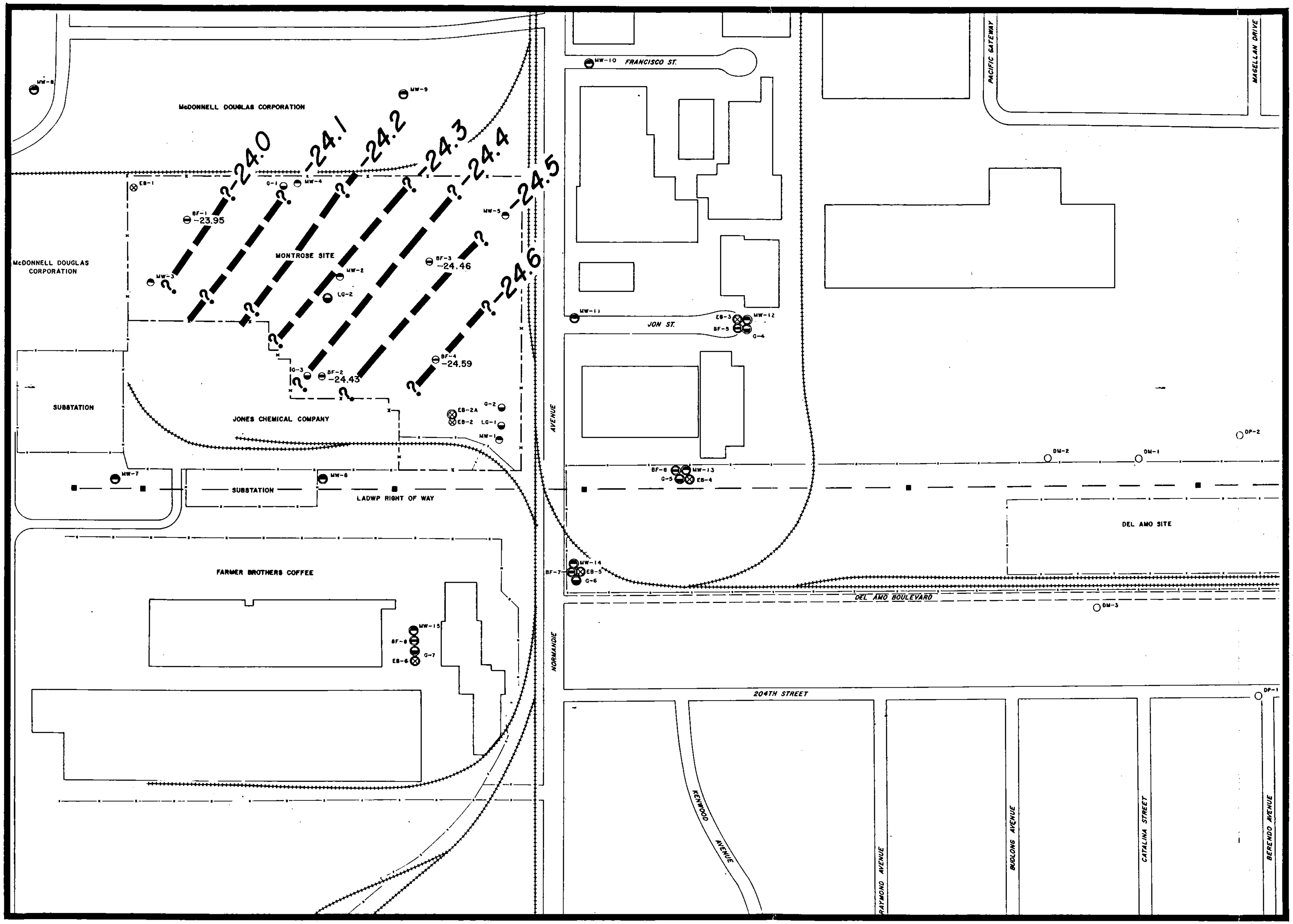
REGIONAL WATER TABLE ELEVATIONS

HARGIS + ASSOCIATES, INC.
Consultants in Hydrogeology
San Diego, California

MARCH 1988
FIGURE 2

PREPARED BY RAH REVIEWED BY MPW

BOE-C6-0185497



EXPLANATION

BF-2 BELLFLOWER SAND MONITOR WELL

-24.43 WATER LEVEL ELEVATION IN FEET, MEAN SEA LEVEL

——— -24.1 ——— — —?

CONTOUR OF EQUAL WATER LEVEL ELEVATION IN BELLFLOWER SAND MONITOR WELLS
DASHED WHERE APPROXIMATE, QUERIED WHERE INFERRED
GROUNDWATER LEVELS MEASURED ON FEBRUARY 25, 1987

SEE FIGURE 5 FOR COMPLETE EXPLANATION OF MAP SYMBOLS

0 200 400 600

FEET

MONTROSE SITE AND VICINITY
TORRANCE, CALIFORNIA

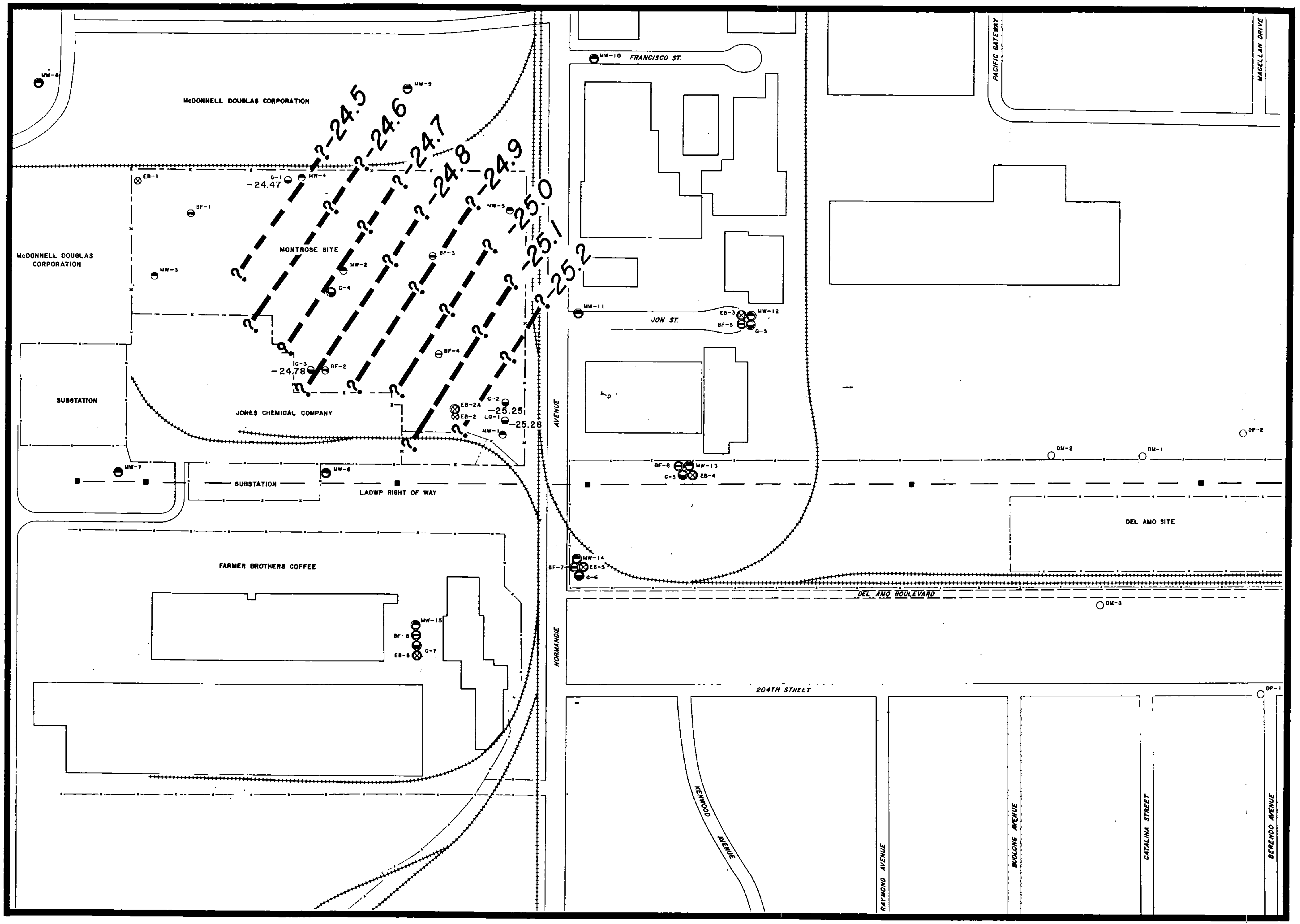
GROUNDWATER ELEVATION CONTOURS
BELLFLOWER SAND MONITOR WELLS

HARGIS + ASSOCIATES, INC.
Consultants in Hydrogeology
San Diego, California

MARCH 1988

FIGURE 3

PREPARED BY RAH REVIEWED BY MPW



EXPLANATION

G-2 GAGE AQUIFER MONITOR WELL

-25.25 WATER LEVEL ELEVATION IN FEET, MEAN SEA LEVEL

-25.0 — ?

CONTOUR OF EQUAL WATER LEVEL ELEVATION IN GAGE AQUIFER MONITOR WELLS
DASHED WHERE APPROXIMATE, QUERIED WHERE INFERRED
GROUNDWATER LEVELS MEASURED ON FEBRUARY 25, 1987

SEE FIGURE 5 FOR COMPLETE EXPLANATION OF MAP SYMBOLS

0 200 400 600
FEET

MONTROSE SITE AND VICINITY
TORRANCE, CALIFORNIA

GROUNDWATER ELEVATION CONTOURS
GAGE AQUIFER MONITOR WELLS

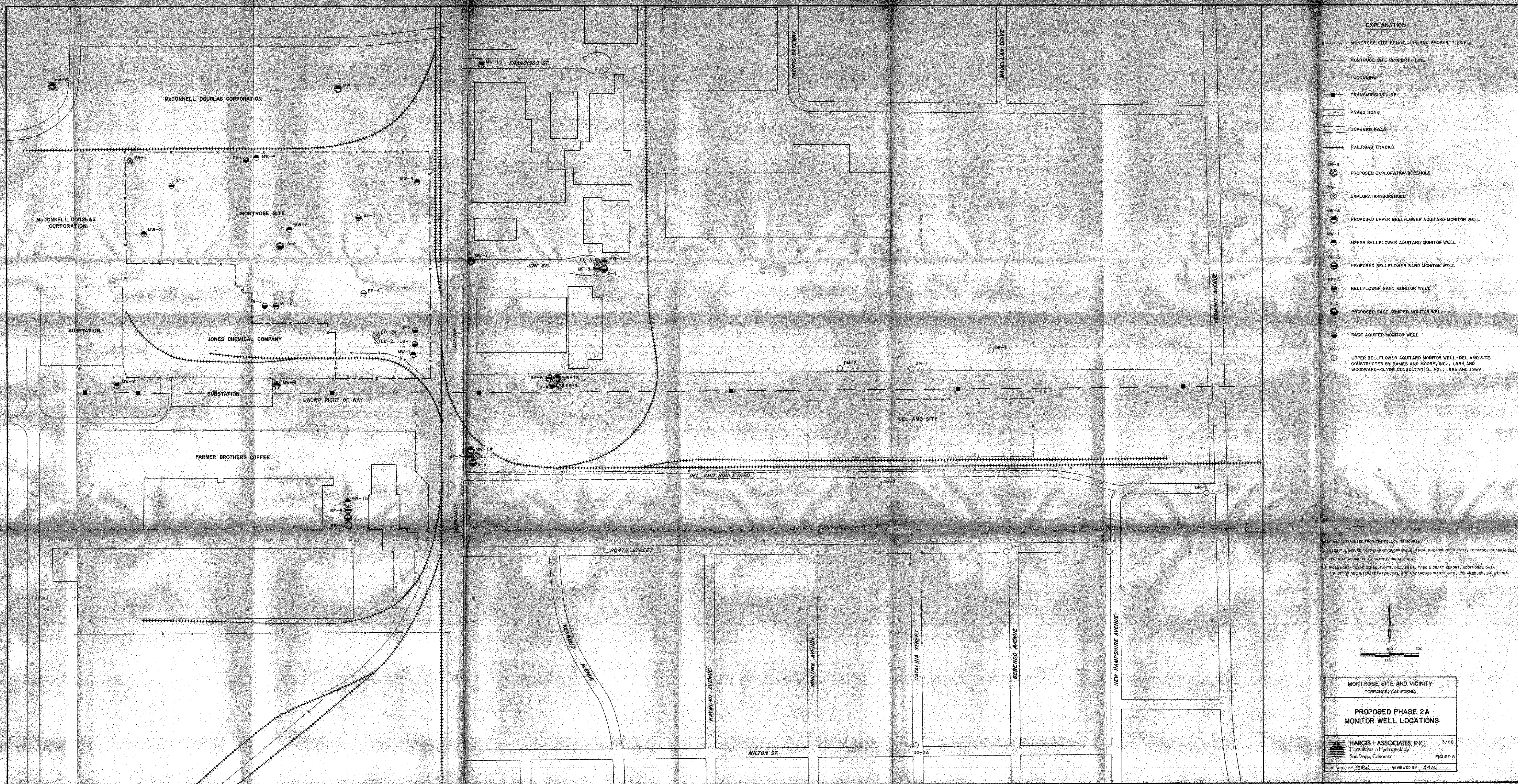
HARGIS + ASSOCIATES, INC.
Consultants in Hydrogeology
San Diego, California

MARCH 1988

FIGURE 4

PREPARED BY RAH REVIEWED BY MPW

BOE-C6-0185499



BOE-C6-018500

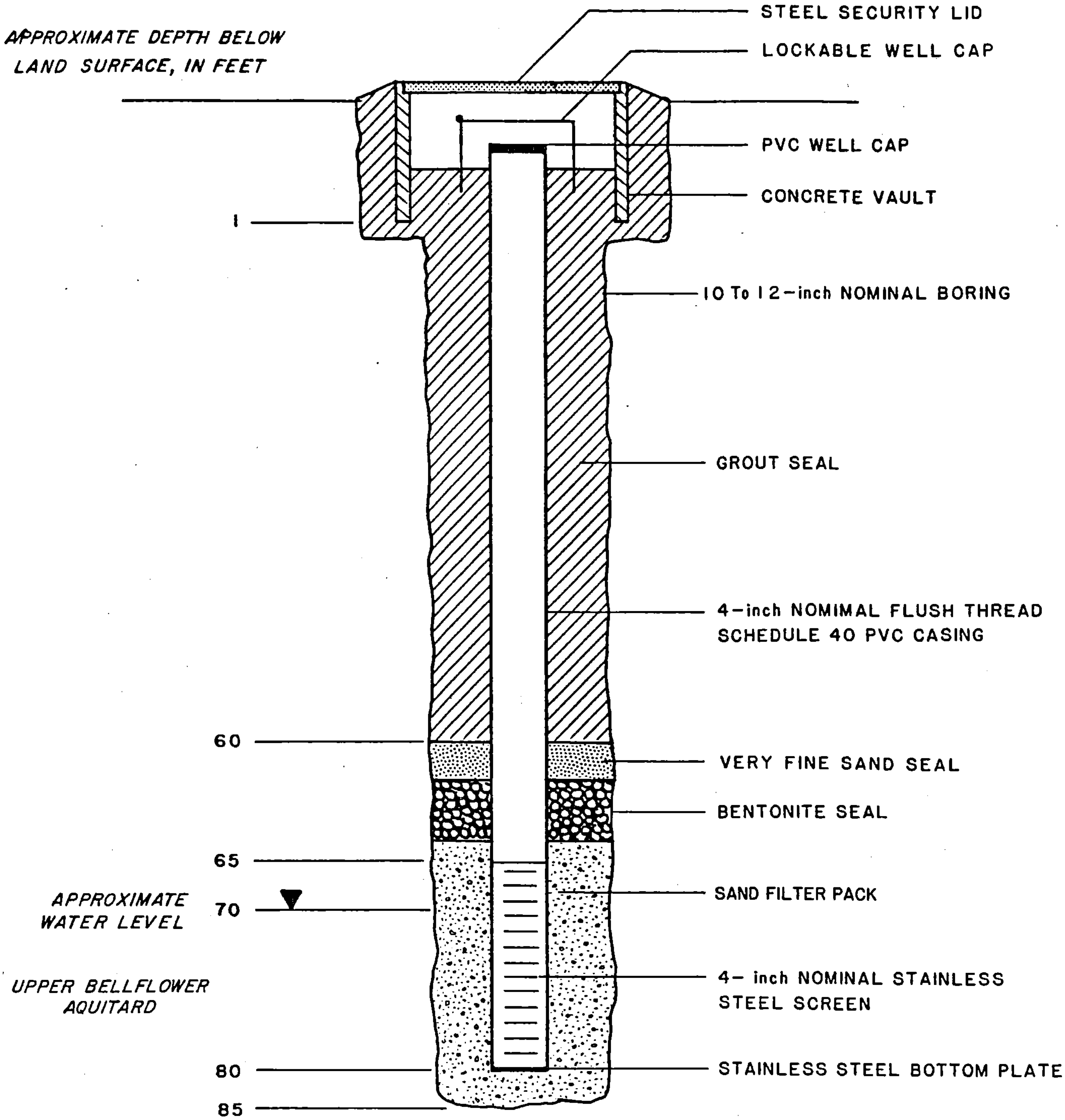


FIGURE 6. SCHEMATIC CONSTRUCTION DIAGRAM FOR PROPOSED UPPER BELLFLOWER AQUITARD MONITOR WELLS

HARGIS + ASSOCIATES, INC.

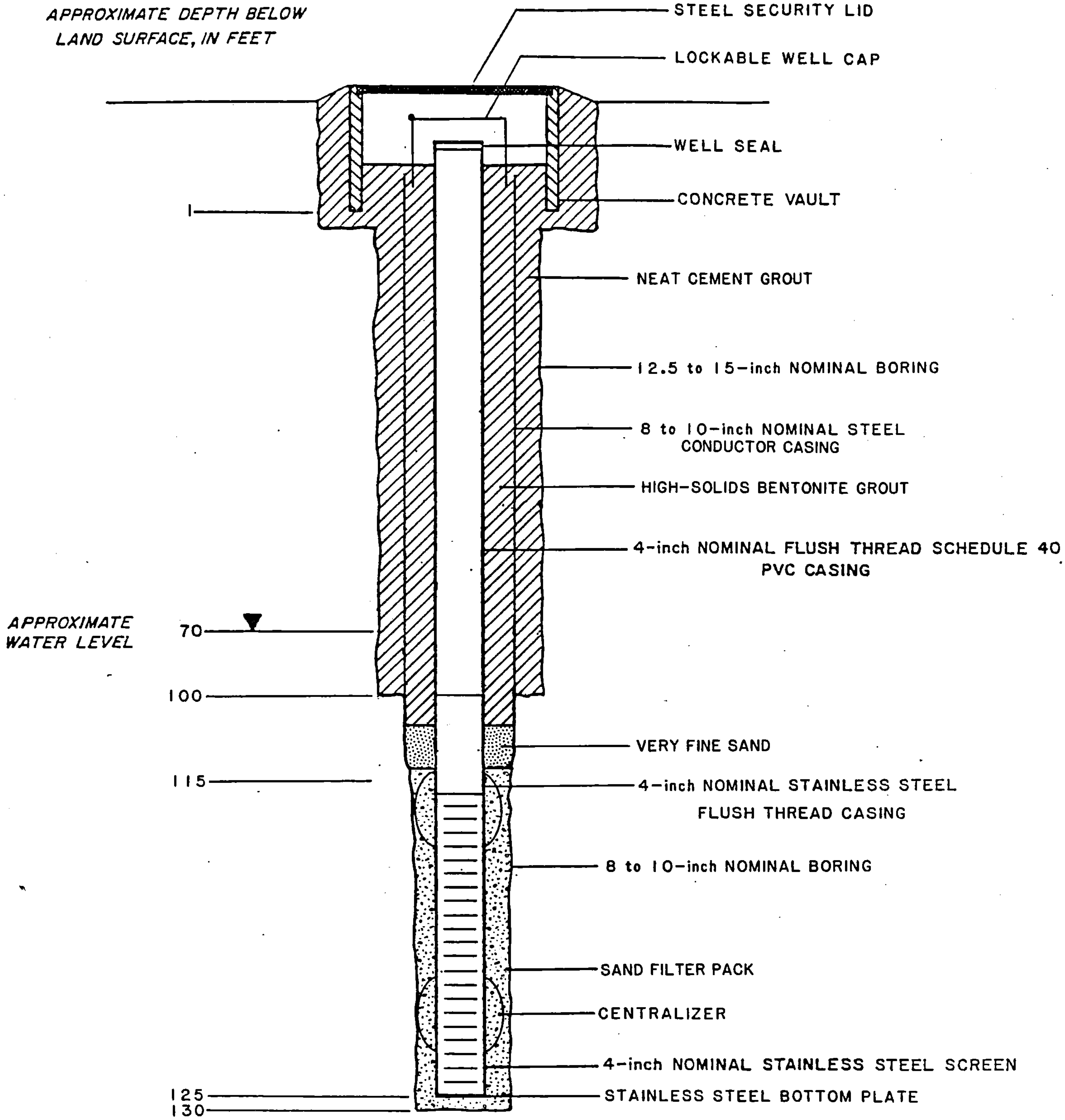


FIGURE 7. SCHEMATIC CONSTRUCTION DIAGRAM FOR PROPOSED BELLFLOWER SAND MONITOR WELLS

HARGIS + ASSOCIATES, INC.

BOE-C6-0185502

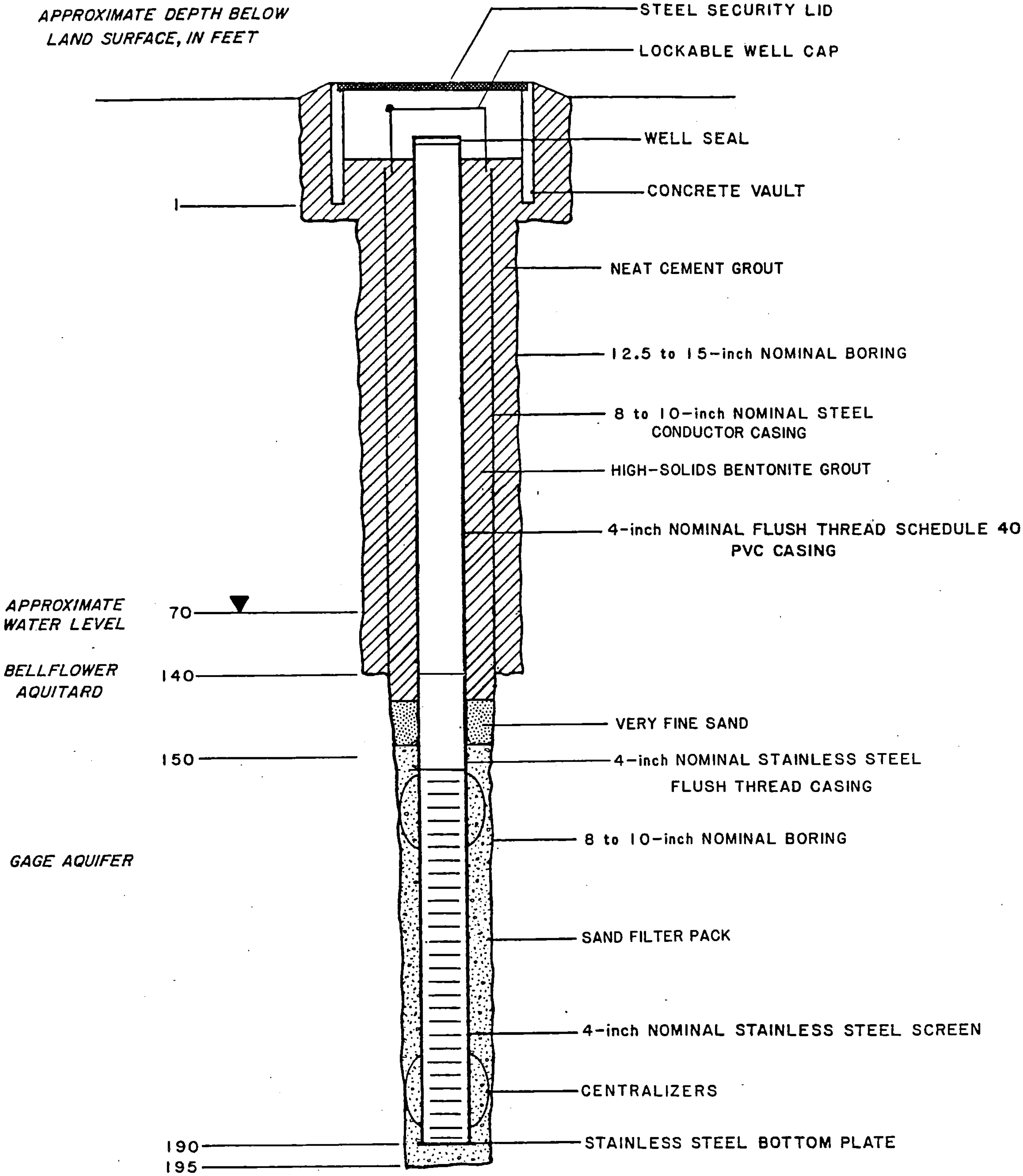


FIGURE 8. SCHEMATIC CONSTRUCTION DIAGRAM FOR PROPOSED GAGE AQUIFER MONITOR WELLS

HARGIS + ASSOCIATES, INC.

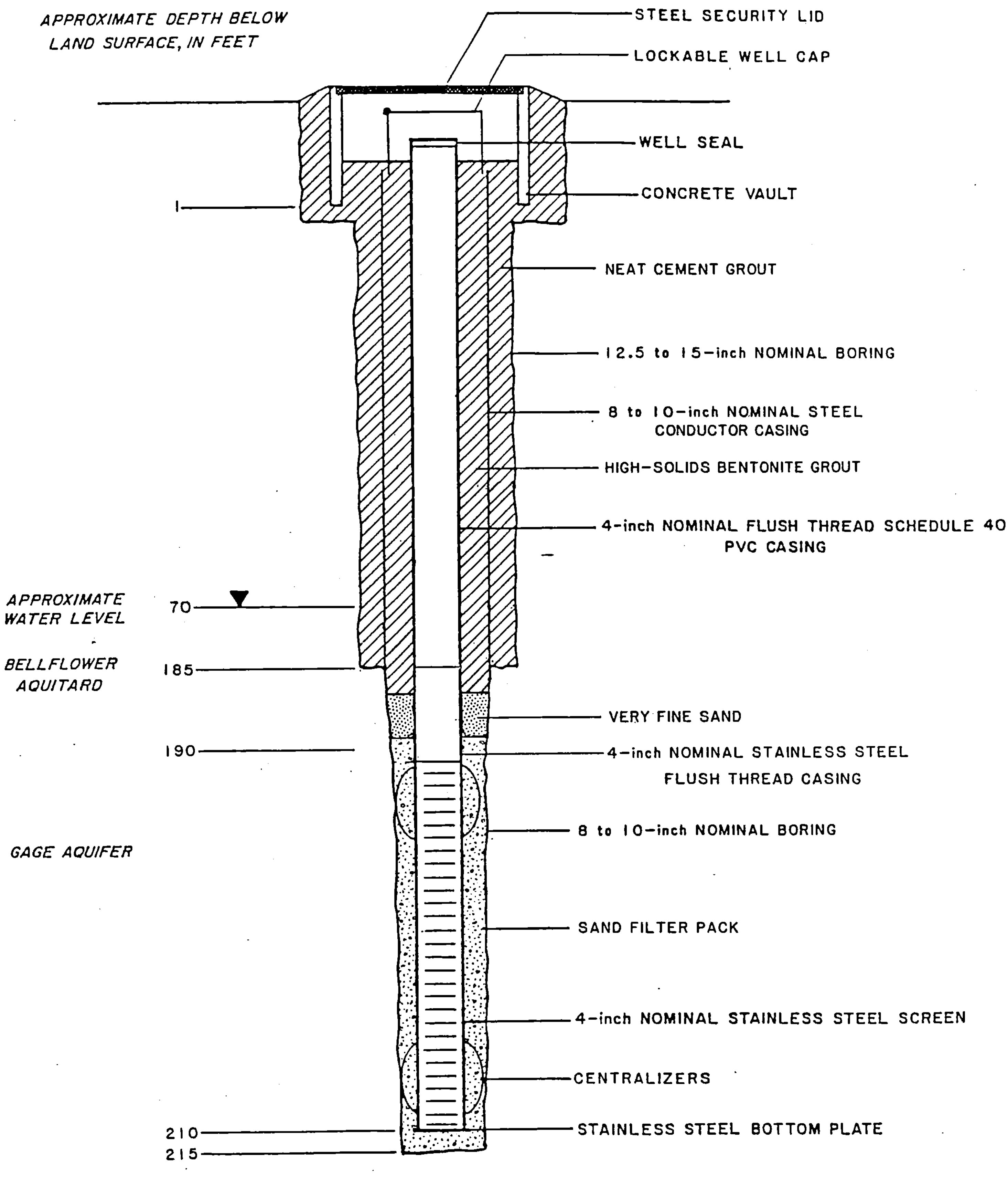
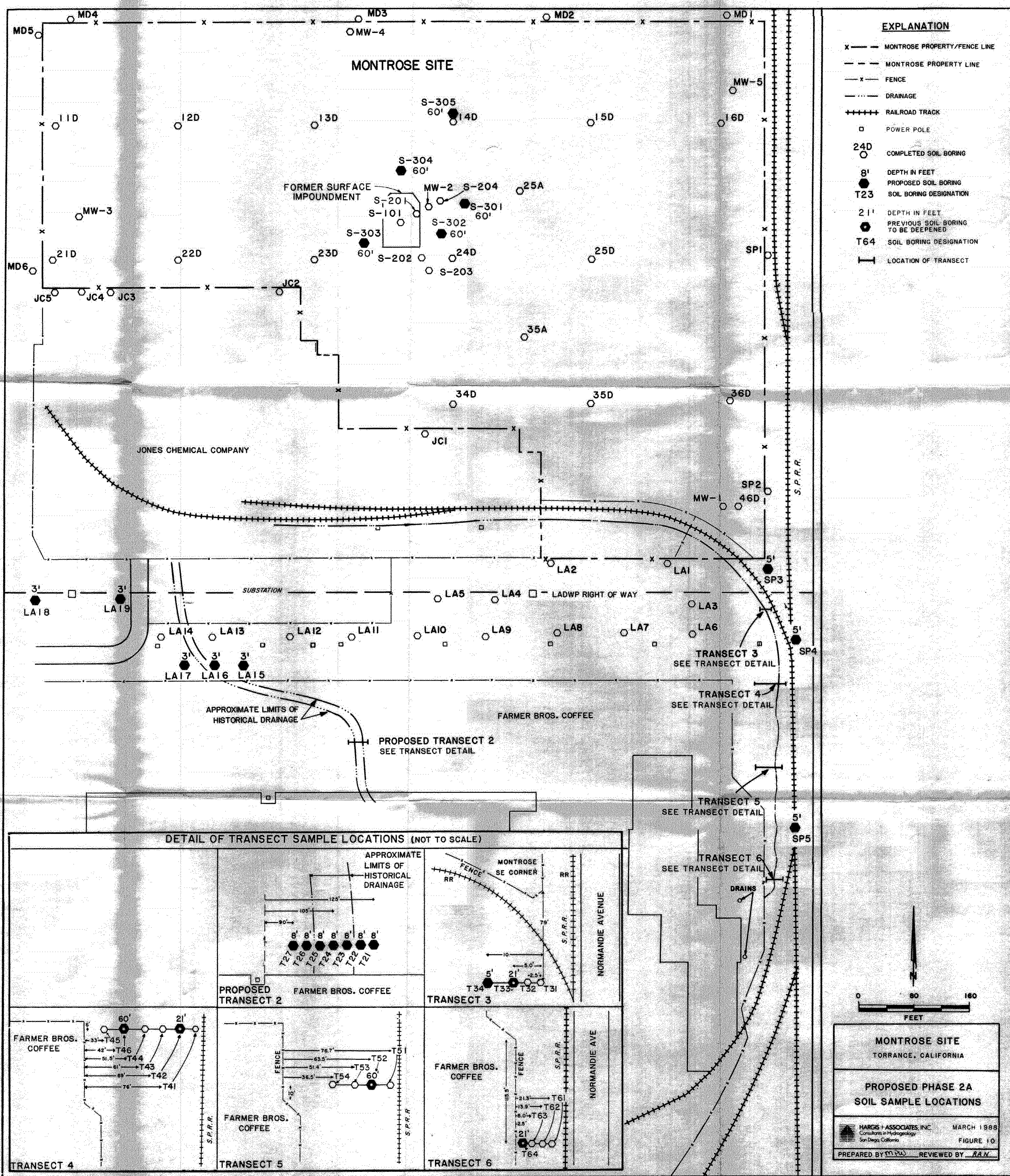


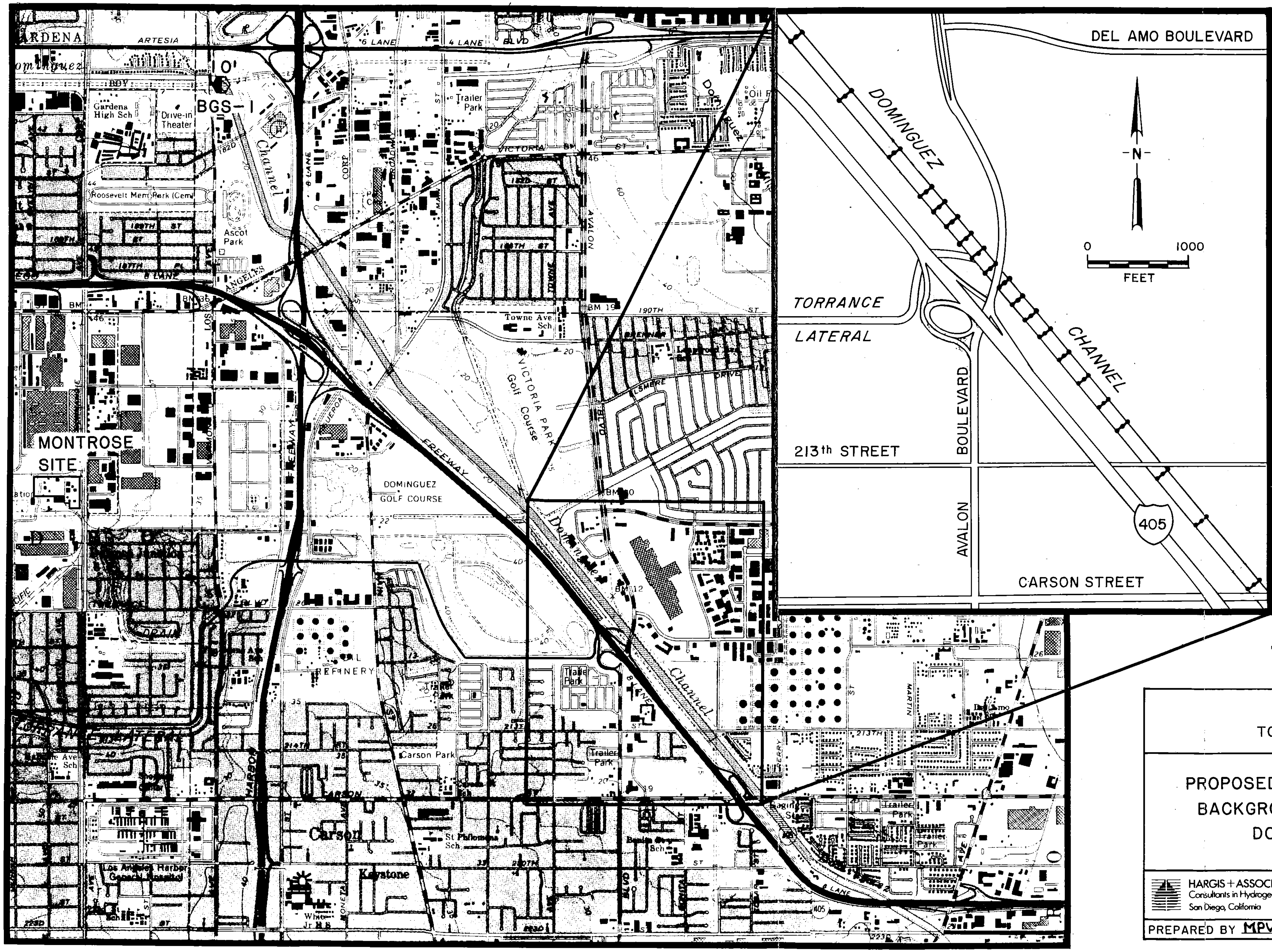
FIGURE 9. SCHEMATIC CONSTRUCTION DIAGRAM FOR PROPOSED LOWER GAGE AQUIFER MONITOR WELL

HARGIS + ASSOCIATES, INC.

BOE-C6-0185504



BOE-C6-0185505



EXPLANATION

10' TOTAL DEPTH OF BORING

BGS-1 PROPOSED BACKGROUND SEDIMENT SAMPLE LOCATION

LOCATION OF SEDIMENT THICKNESS TRANSECT

MONTROSE SITE

TORRANCE, CALIFORNIA

PROPOSED SEDIMENT TRANSECT AND BACKGROUND SAMPLE LOCATIONS DOMINGUEZ CHANNEL

HARGIS + ASSOCIATES, INC.
Consultants in Hydrogeology
San Diego, California

MARCH 1988

FIGURE 11

PREPARED BY MPW REVIEWED BY RAN

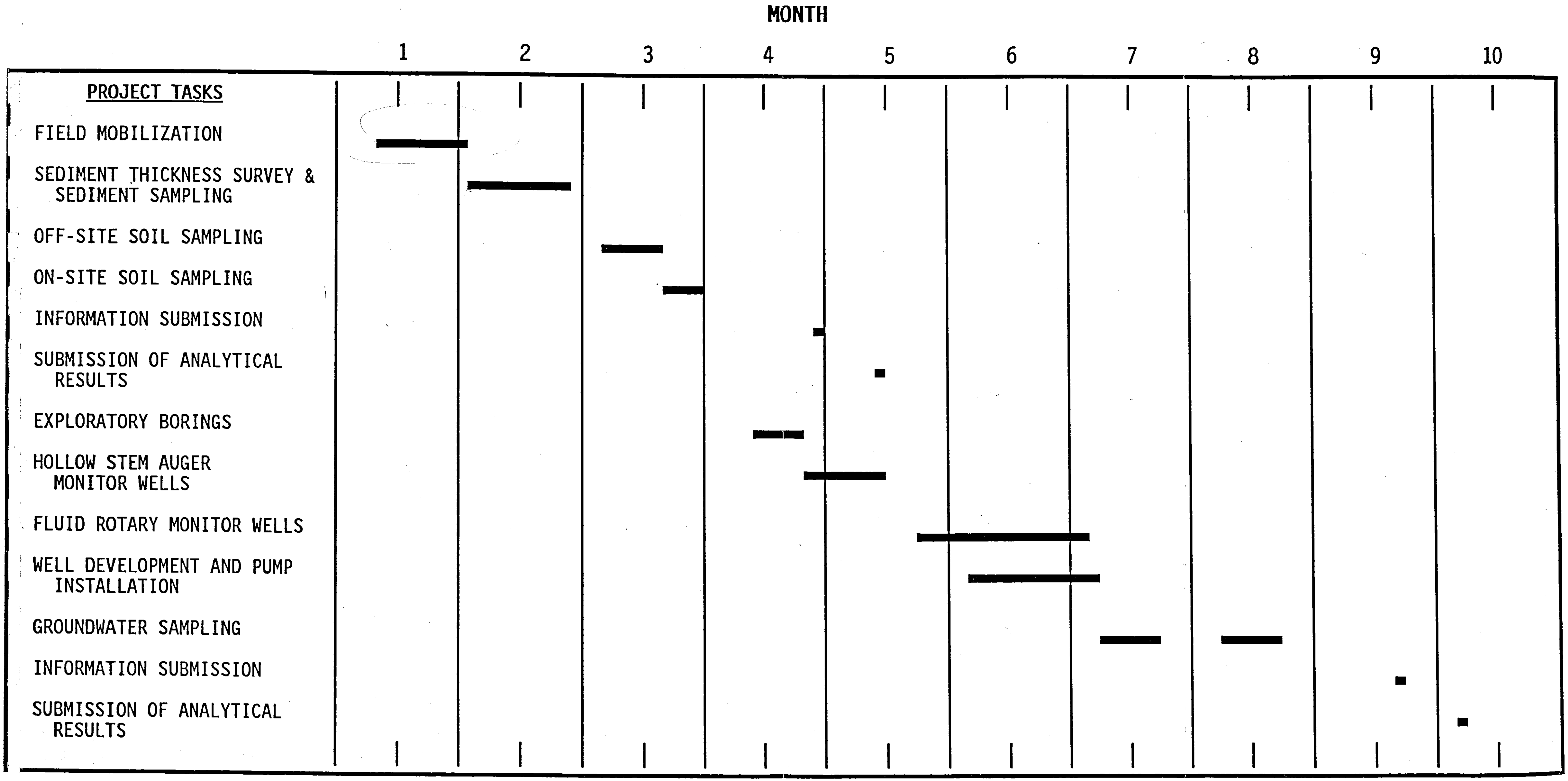


FIGURE 12. PROJECTED WORK SCHEDULE

HARGIS + ASSOCIATES, INC.